4

ELECTRICAL REVIEW

FRIDAY
3 NOVEMBER 1961

WEEKLY
PRICE 1s 6d

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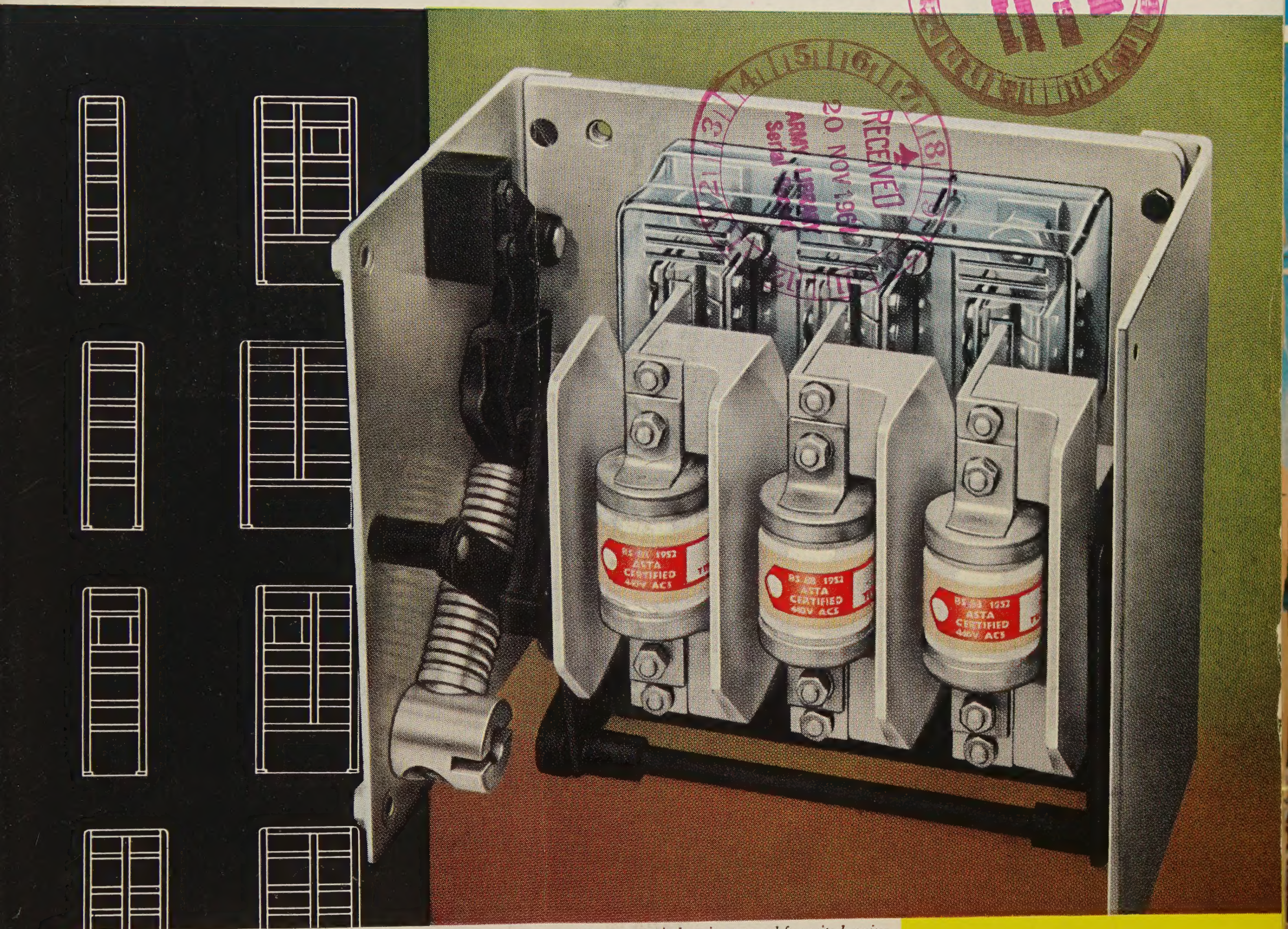


300 amp. switch unit removed from its housing.

ELLISON

HEAVY DUTY FUSE-SWITCHGEAR

EXCEEDS THE REQUIREMENTS OF B.S. 3185: 1959

MAKING CAPACITY
46,000 amps. at 550 volts, ·15 power factor.

SWITCH BREAKING CAPACITY
6 to 8 times the rating at ·25/·3 power factor.

BUSBAR COPPERWORK
complies with B.S. 159: 1957

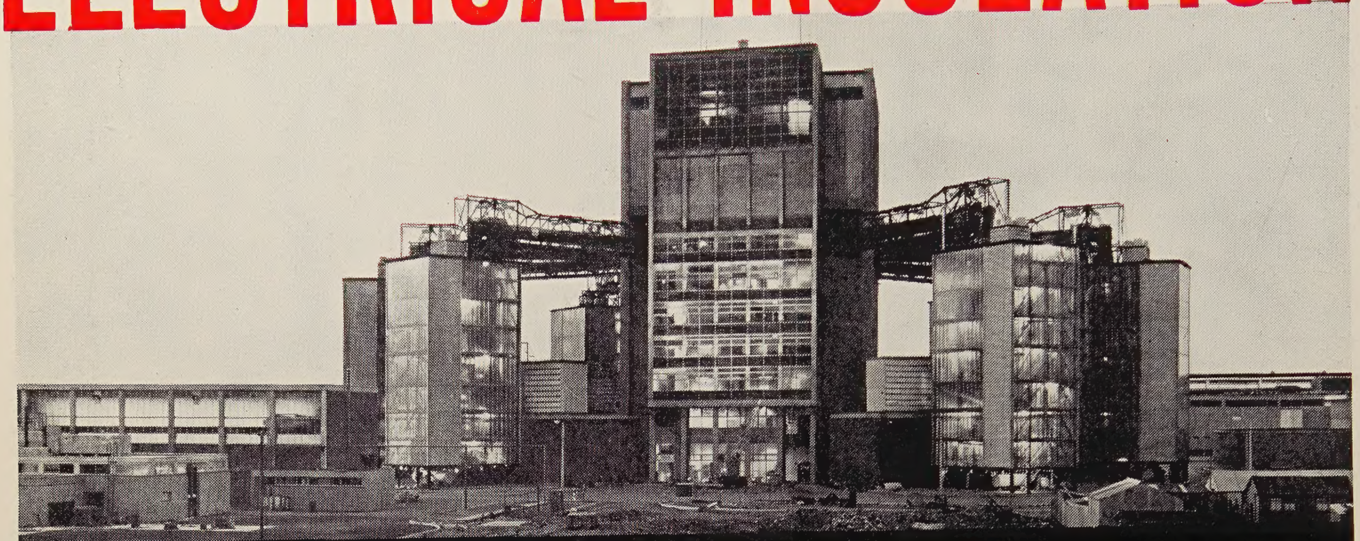
550 VOLT A.C.

GEORGE ELLISON LIMITED PERRY BARR · BIRMINGHAM 22B

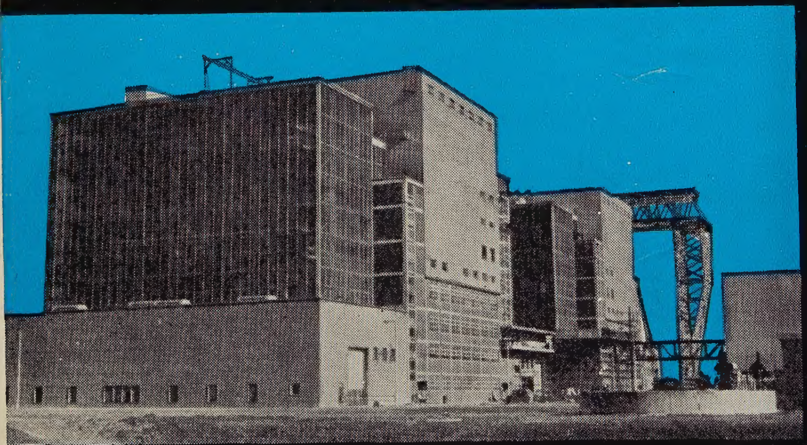
870

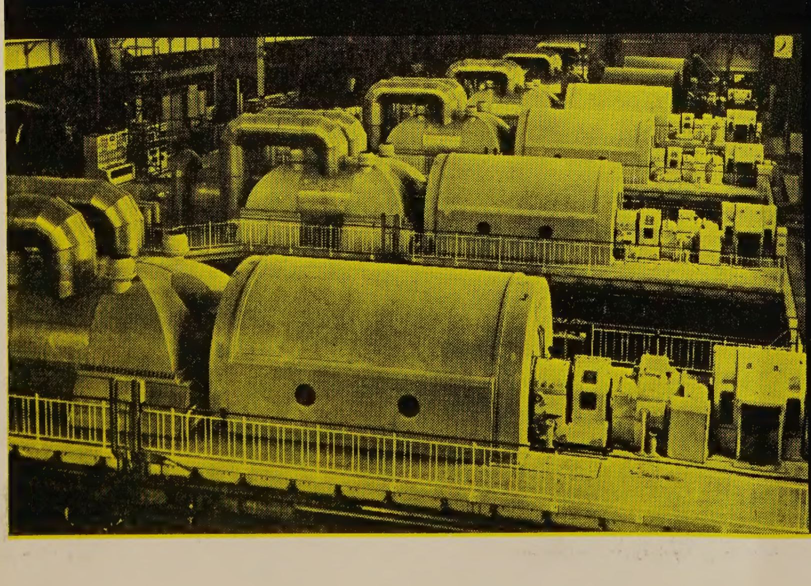
ULATION COPY 1

ELECTRICAL INSULATION



for Nuclear Power Stations





The first two C.E.G.B. Nuclear Power Stations both make extensive use of M&I insulation; in the electrical plant supplied by A.E.I. to Berkeley and by C. A. Parsons & Co. Ltd., to Bradwell. Amongst the various types of insulation supplied are "Paxolin" tubes, transformer cylinders and fabric based material as well as Micanite in various forms including V-rings.

As the manufacturers of the most extensive range of electrical insulating materials in this country M & I naturally have a wide experience of insulation problems on every type of power generation and distribution system.

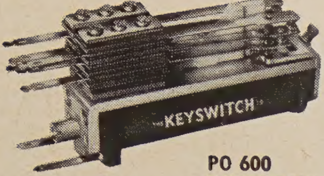
m and i

the electrical insulation people

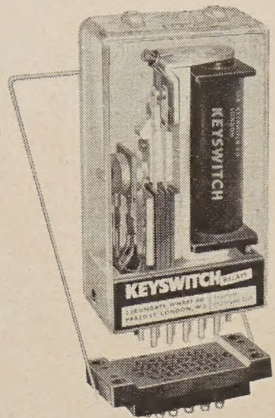
THE MICANITE & INSULATORS CO., LTD.,
Walthamstow, London, E.17.
Tel: Larkswood 5500.
Grams: Mytilite, London, Telex. Telex 25183

Photographs by courtesy of The Nuclear Power Group.
Bottom picture shows the six Parsons 52MW turbo-generators in which M & I Micanite V-rings have been used.

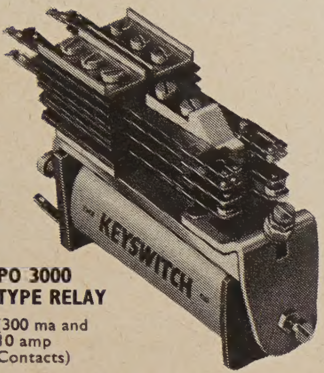
RELAYS



PO 600 TYPE RELAY
(Minor)

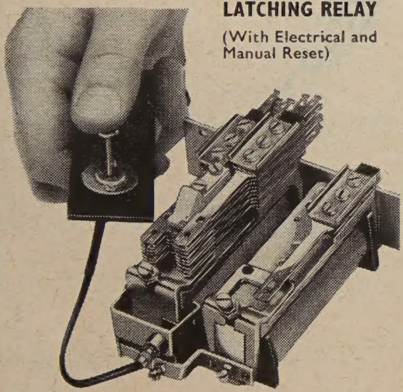


PLUG IN 3000 TYPE RELAY
(Moulded Cover and base)
With transistorised amplifier



PO 3000 TYPE RELAY
(300 ma and 10 amp Contacts)

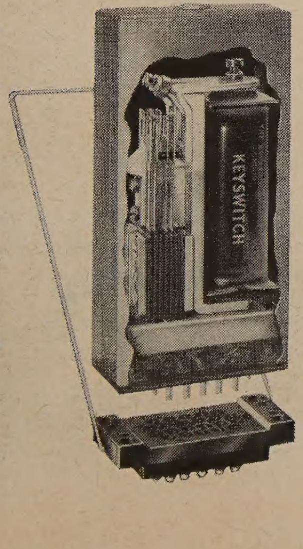
KEYSWITCH RELAYS



LATCHING RELAY
(With Electrical and Manual Reset)

SILENT A.C. RELAY CONTACTOR
(Switching 30 amps)

(240 volts A.C.)



PLUG IN 3000 TYPE RELAY
(Metal Cover)

Manufactured as required for customers' own applications in :

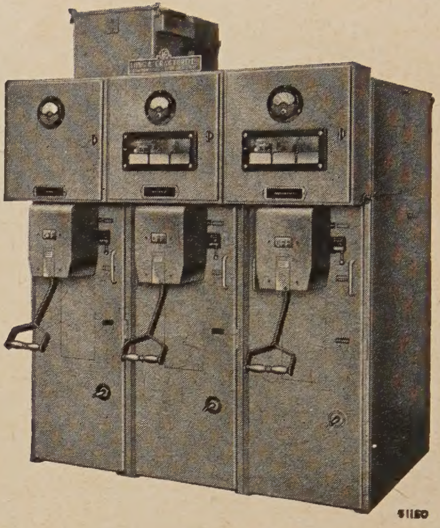
AUTOMATION • COMPUTERS • TELEPHONE and INTERCOM SYSTEMS • BATCH COUNTING and PHOTO-ELECTRICS • MOTOR and MACHINERY CONTROL • AUTO-TIMING and AUTOMATIC SIGNALS • CURRENT and VOLTAGE REGULATION, etc.

Calculator providing full Relay Specifications is available FREE on request

Contact Sales Director
KEYSWITCH RELAYS LTD
IRONGATE WHARF ROAD
PRAED STREET, LONDON, W.2
Telephone: PADdington 2231 (6 lines)

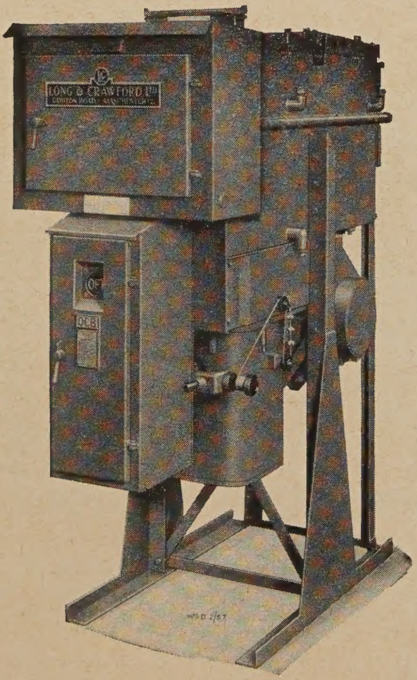
Extremely advantageous quotations and delivery can be offered for quantity orders.

CIRCUIT BREAKERS



INDOOR UNITS

ALD range of indoor vertical isolation air-insulated Circuit Breaker Units. Current rating up to 1,200 amps. Rated breaking capacities up to 350 MVA at 11 kV, 250 MVA at 6.6 kV and 150 MVA at 3.3 kV. Fitted with Hand, Spring or solenoid power-closing mechanism.



OUTDOOR UNITS

WPD range of outdoor oil and compound filled Circuit Breaker Units. Current ratings 400/800 amps. Tested fault ratings: 350 MVA at 11 kV and 250 MVA at 6.6 kV. Spring, Hand or solenoid mechanisms.

LONG & CRAWFORD LTD.

GORTON ROAD, MANCHESTER 12

EVEN A DETECTIVE COULDN'T FIND ANY OTHER FLUORESCENT LAMPS WITH ALL THESE FIVE ADVANTAGES

You can search high and low but, wherever you look, you'll always find it's only Philips who offer fluorescent lamps with all five of these major advantages. So, for fluorescent that's far, far ahead, specify Philips!

1 De luxe lamps with double phosphor coating — Colour 32 the established choice for superb lighting of food; and Colour 34 for lighting clothes. Specify double-coated — they cost no more than single-coated de luxe.

2 Grain-size selected phosphors for maximum lumen output. Ultra modern machinery mills phosphor particles to the optimum size, rejects any that are not right. Hence the top luminous efficiency, maintained throughout the life of the lamp.

3 A special binder guards the electrode emissive coating and, together with high purity fill gases, ensures life that is getting longer and longer.

4 All standard lamps above have *both* silicone coating *and* earthing strip. 'Belt and braces' technique gives sure starting, means one stock type only for each and every fitting.

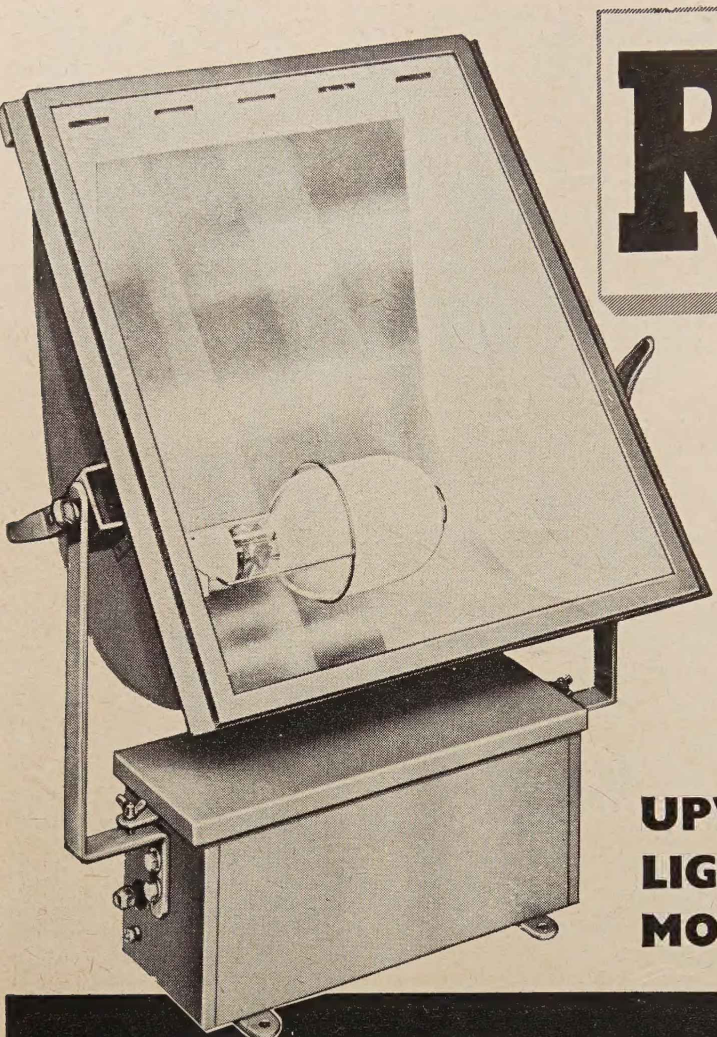
5 Fully closed anode ring (80w 5 ft.) reduces end-blackening and extends electrode life.

Once again

PHILIPS LEAD THE WORLD IN LIGHTING

PHILIPS ELECTRICAL LTD · LAMP & LIGHTING GROUP · CENTURY HOUSE · SHAFTESBURY AVENUE · LONDON WC2

(LD3300)



R E A L

R.E.A.L. IS A REGD. TRADE MARK

UPWARD LIGHTING MODEL

MERCURY FLOODLANTERN

for 250/400 watt MBF/U Lamps

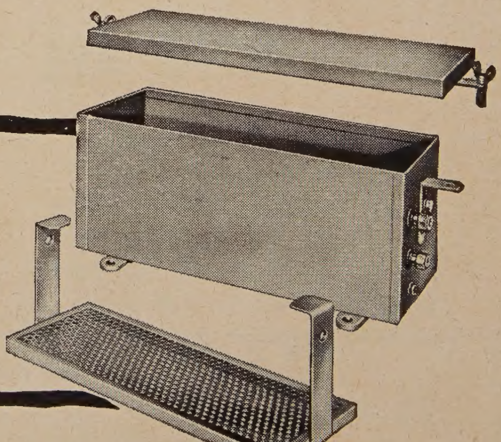
List No. 1231. This Weatherproof Lantern incorporates a Parabolic asymmetric Reflector 3" focus, and is suitable for short or medium range floodlighting of vertical surfaces.

It is just one of the R.E.A.L. range of Floodlanterns comprising some fifty models and catering for practically every type and size of lamp.

'UNIVERSAL' CONTROL GEAR BOXES

List No. 1209. The perforated tray supplied with the R.E.A.L. Box greatly facilitates gear mounting.

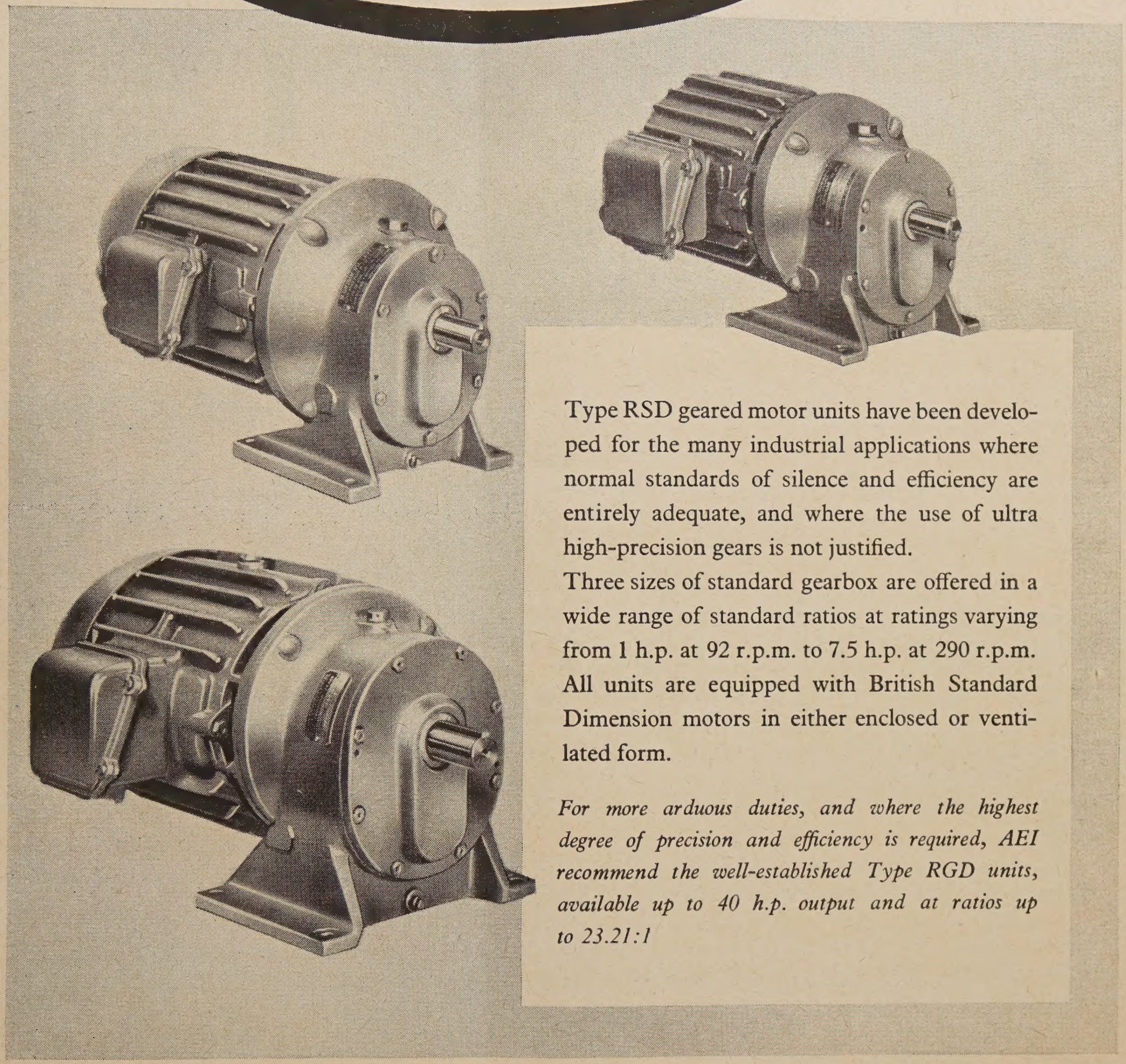
Each Box fitted with packed glands for incoming and outgoing cables.



Have you yet received your copy of LIST P.6004?

ROWLANDS ELECTRICAL ACCESSORIES LIMITED, R.E.A.L. WORKS, BIRMINGHAM, 18

Low-cost
geared motor units for industrial service



Type RSD geared motor units have been developed for the many industrial applications where normal standards of silence and efficiency are entirely adequate, and where the use of ultra high-precision gears is not justified.

Three sizes of standard gearbox are offered in a wide range of standard ratios at ratings varying from 1 h.p. at 92 r.p.m. to 7.5 h.p. at 290 r.p.m. All units are equipped with British Standard Dimension motors in either enclosed or ventilated form.

For more arduous duties, and where the highest degree of precision and efficiency is required, AEI recommend the well-established Type RGD units, available up to 40 h.p. output and at ratios up to 23.21:1

AEI

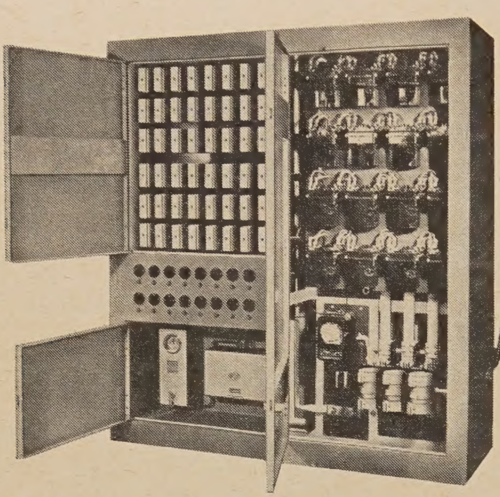
Associated Electrical Industries Limited
Motor and Control Gear Division
RUGBY AND MANCHESTER , ENGLAND

A5400

BKS

Heating Control Panels

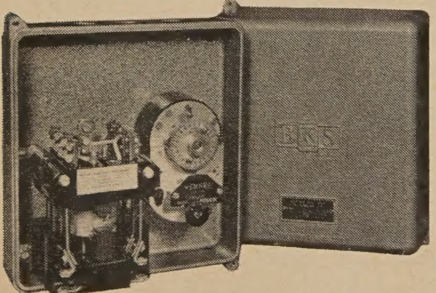
built to individual Specifications



THERMAL STORAGE HEATING

With the special off-peak tariffs now available through the electricity authorities, the overall cost of thermal storage space heating has been reduced to a most economical figure. We are specialists in the design and manufacture of automatic panels for space heating control and have supplied panels handling up to 500 kW.

The panel illustrated handles 267 kW and is divided into 16 zones with individual limit thermostats and overall control by time switch; together with anticipatory control unit. We shall be most happy to quote for your automatic control panel.



Triple pole 30 amp. Contactor with Time Switch type MD1SP

CONTACTORS

- Comprehensive range of contactors for all types of thermal storage and space heating control —10 to 350 amp. SINGLE, DOUBLE, TRIPLE AND FOUR POLE.
- FOR SILENT OPERATION. All models can be fitted with D.C. operating coil and rectifier.

BRITISH KLOCKNER SWITCHGEAR LTD.

Head Office and Works: Chertsey, Surrey

Telephone: Chertsey 3467 Telegrams: Switchgear, Chertsey

Branches at Manchester, Glasgow, Newcastle, Midlands and Eire

Agents throughout the world

ASSOCIATED COMPANY

Hindustan Klockner Switchgear Limited, Bombay

post this coupon TODAY!

To BRITISH KLOCKNER SWITCHGEAR LTD., CHERTSEY, SURREY

Please send me your list of Contactors for Heating Control

NAME ....

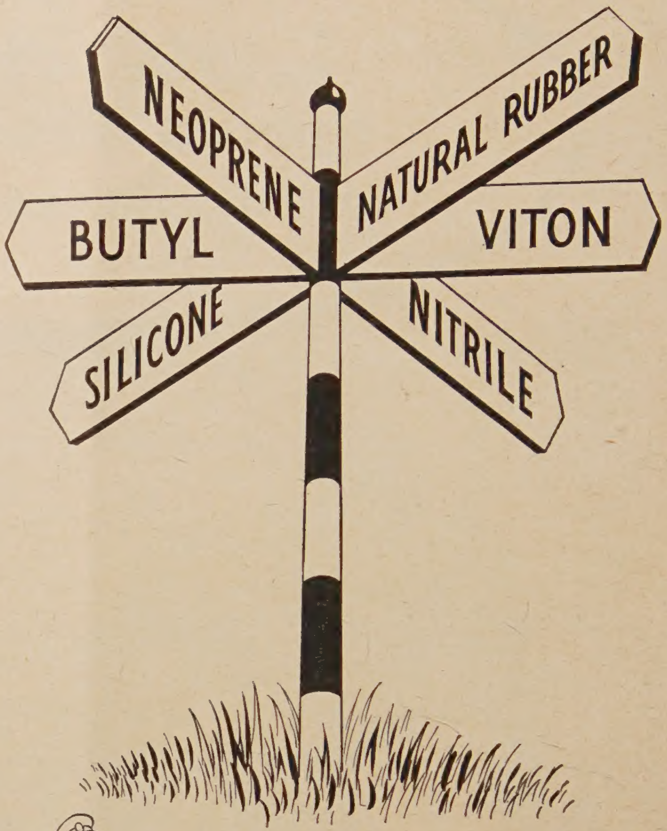
POSITION ....

FIRM ....

ADDRESS ....

HCPR

Which way in rubber?



Will direct you-precisely!

P.R. Research Laboratories offer the widest range of synthetic rubber compounds available, all developed to meet the exacting and varied working conditions of modern industry.

P.R's advanced production techniques and the strict control of all manufacturing operations ensure mouldings and extrusions of the highest grade and to close dimensional accuracy.

Please write for technical literature.

The Symbol of precision PR *in rubber engineering*

MOULDINGS
"O" RINGS
EXTRUSIONS
DIAPHRAGMS

"PRESCOLASTIK" Silicone rubbers
Regd. Trade Mark

PRECISION RUBBERS LIMITED

BAGWORTH · LEICESTER · TEL: BAGWORTH 361/6

L·E·W·

TRANSPOSED "LEWMEX"
INSULATED STRIP
FOR
TRANSFORMER
WINDINGS

REMEMBER POPPY DAY

Photograph by courtesy of Hackbridge & Hewittic Electric Co. Ltd.

Transposition
5 to 29 Strips

Strips from ·050″ to ·100″ thick
·120″ to ·300″ wide

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED

LEYTON · LONDON · E10

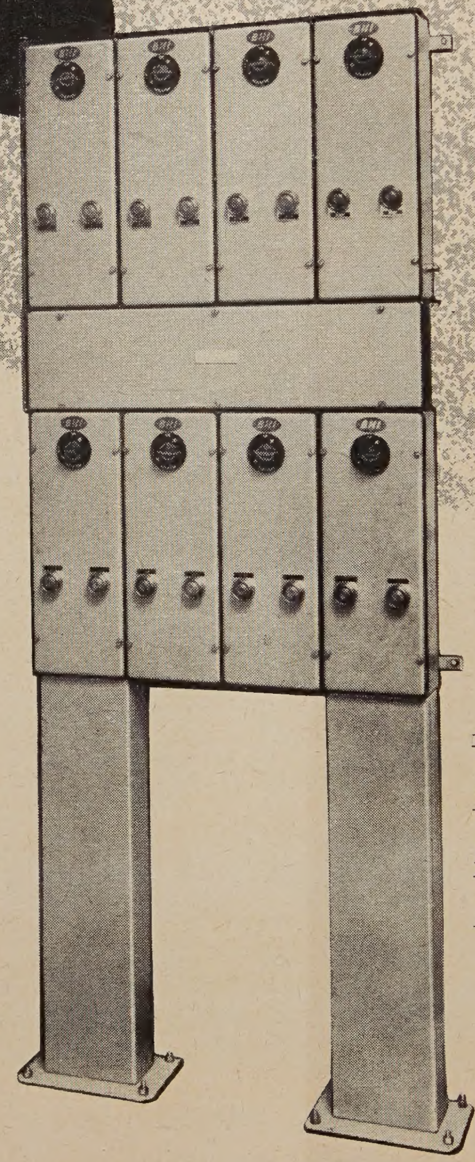
LEW FS VACTITE M PURSMEF

SIMPLEST CONNECTION

SIMPLEST INSTALLATION

THE NEW

BUSBAR 8-16-120

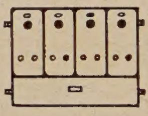


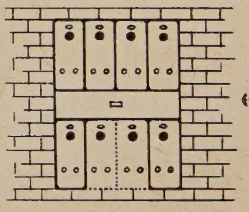
The new BUSBAR Eight-Sixteen-One Twenty is unique among switchboards. It enables you to install the maximum number of starters in the minimum space with the least wiring, whether for factory or store, hotel or hospital, block of flats or offices.

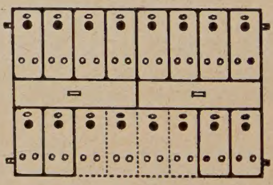
The BUSBAR Eight-Sixteen-One Twenty is basically a busbar chamber carrying ready-connected starters—up to **8**, or up to **16** in two-chamber width, controlling a maximum **120** h.p. total (each starter up to 7½ h.p. 380-550v across-the-line, with integral isolator and H.R.C. fuses). You merely clamp a supply wire to each busbar.

Alternatively, you can dispense with the busbars, using the chamber as a cable trunking. In any case, the switchboard is only 4″ deep x 28″ wide (eight starters) or 56″ (sixteen starters). It can be wall-mounted, floor-mounted or built-in flush to the wall in ONE BRICK'S DEPTH. Unused starter spaces can be equipped at any time.

The BUSBAR Eight-Sixteen-One Twenty offers you choice of numbers, choice of mounting, choice of connection method.





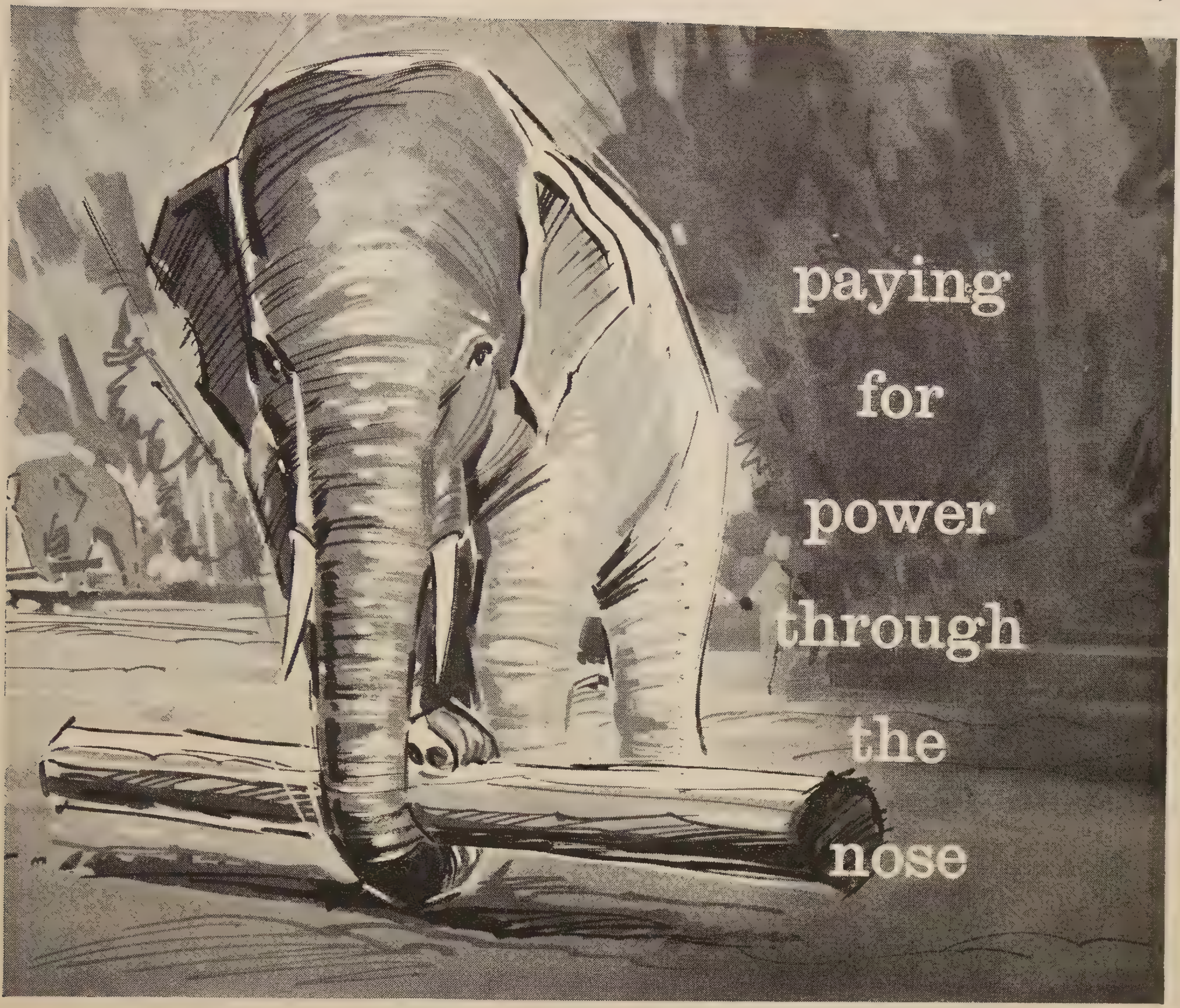


Metal Industries Group

BROOKHIRST IGRANIC

Enquiries to:
NORTHGATE WORKS . CHESTER
MAKERS OF BRITAIN'S WIDEST RANGE OF ELECTRICAL CONTROL & ASSOCIATED EQUIPMENT

BI/54



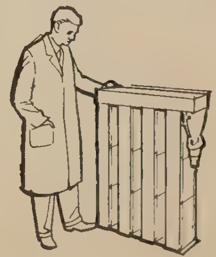
The capacity to economise is a rare human quality. It is, however, manufactured by STC! We mean, of course, Power Factor Correction and what it can save you by cutting surcharges for kVA.

The low Power Factor associated with most industrial loading—induction motors, welders, furnaces, etc.—can be corrected simply and economically with the latest ranges of Power Capacitors by STC. Employing unit construction, these robustly built, oil-filled capacitors are simple to install, occupy a minimum of floor space and are easily adaptable to changing plant requirements.

Why pay for power through the nose when the capacity to economise is immediately available from STC?

STC

POWER CAPACITORS FOR POWER FACTOR CORRECTION



Write for Power Factor Correction Literature to:

Standard Telephones and Cables Limited

CAPACITOR DIVISION: BRIXHAM ROAD · PAIGNTON · DEVON

61/3MC

for
MICA TAPES
INSULATION

Consult
EAST LONDON MICA WORKS
RINGWOOD RD., WALTHAMSTOW, LONDON, E.17
ESTD. 1912
Phone: COPpermill 2248/9 *Telegrams:* Elmicmer, Easphone, London

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Mercury switches

THE MERCURY SWITCH MANUFACTURING COMPANY LIMITED are the largest specialised manufacturers of Mercury Switches in Great Britain. These are made to exceptionally high and uniform standards of quality.
Since its inception in 1932, this Company has concentrated solely on the production of Mercury Switches. It has thereby obtained the widest possible experience and expert knowledge of design manufacture and application.

THE MERCURY SWITCH
MANUFACTURING COMPANY LIMITED
WEST DRAYTON + MIDDLESEX
West Drayton 2291/2/3

MS 12

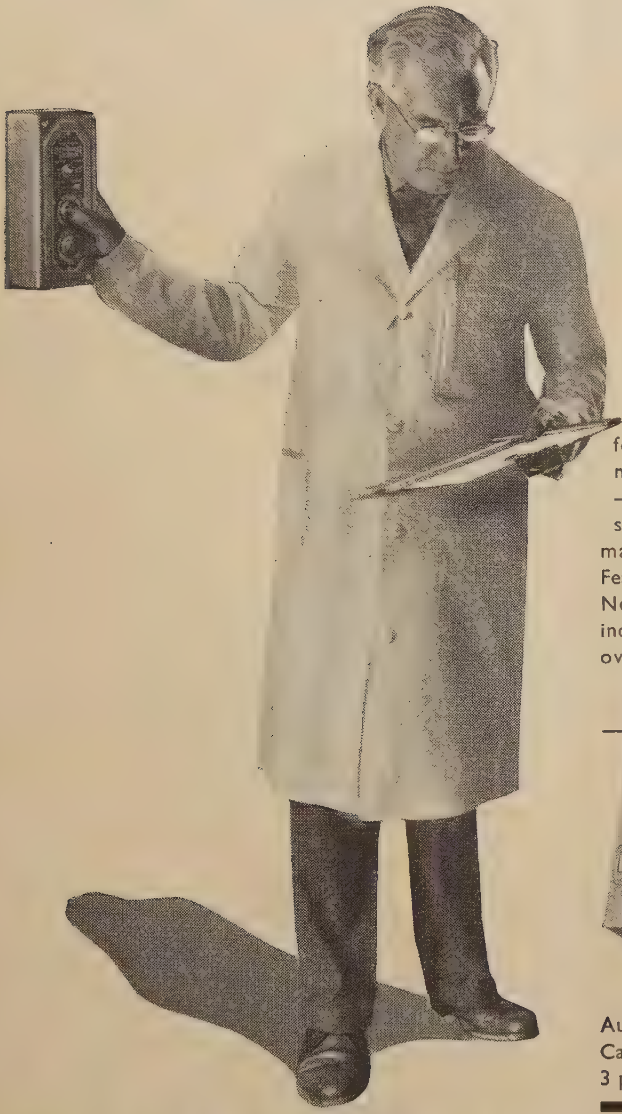
HANDLES

Fixing Centres
2½" 3" 4"
5" 7" 9"
Full range of colours

Litholite
Plastic Moulders since 1901

LITHOLITE Insulators & St. Albans MOULDINGS LTD.
Sandown Road, WATFORD, Herts. Tel. WATFORD 23377

a FORGOTTEN starter is worth REMEMBERING

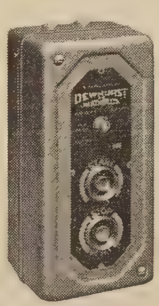


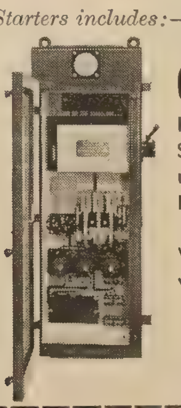
Talk to any of our customers and it's quite possible that they've forgotten they use DUPAR Starters. It's not surprising, really. People never have to give DUPAR Starters a second thought once installed because they just go on giving trouble-free service for years on end. The exclusive "Double Safety" ET Protector is one of several types available for every DUPAR Starter and completely eliminates the dangers of motor overloading and *single phasing.* So if you've an electric motor control problem, forget it. Just call in the DUPAR Technical Advisory Service and they will recommend which DUPAR Starter will solve your problem. You will be pleasantly surprised at the respect for your budget.

DUPAR range of Direct on Line Starters includes:—

TFK

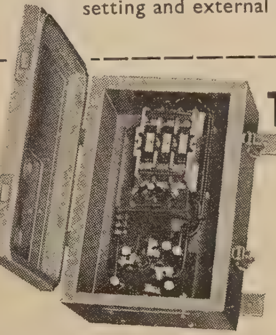
for electric motors ¼-7½h.p. — particularly suitable for machine tools. Features include Neon running indicator, simple overload dial setting and external reset.





CS

Heavy duty Mill Starter for motors up to 120 h.p. Mounted in rugged 10 s.w.g. case. Weatherproof version available.



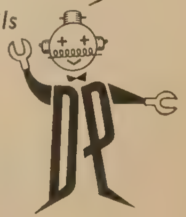
TFH

Automatic Starter for Squirrel Cage Motors up to 15 h.p. at 440v. 3 phase.

We also make starters for

SLIP RING · STAR DELTA & D.C. MOTOR CONTROL

Please ask for details



Write, phone or knock on the door — personal callers are always welcome — however modest their requirements.

DUPAR

DEWHURST
& PARTNER LIMITED

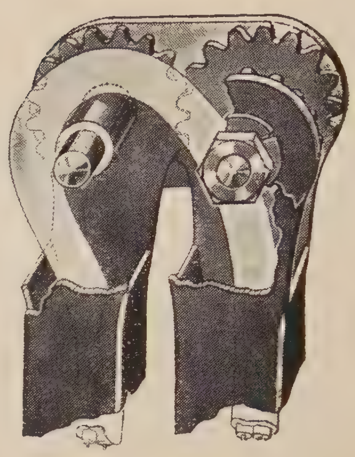
for dependability

INVERNESS WORKS · HOUNSLOW · MIDDX
Telephone: HOUnslow 7791 (12 lines)   Telegrams: Dewhurst, Hounslow
Field Offices at:—
BIRMINGHAM · GLASGOW · GLOUCESTER · LEEDS · MANCHESTER · NEWCASTLE · NOTTINGHAM

MEKELITE

GEARED JOINT

INDUSTRIAL LIGHTING UNITS



The Geared Joints give a full 360 degree movement and ensure throughout that the length of cable wrapped on to one pivot is equal to that unwrapped from the other. Unsightly loops, nipping of cable, and pull on terminals are thus eliminated.

Various lengths of arm (maximum horizontal reach 54 in.). With pillar or short vertical pivot. Five sizes of reflector. Bases for wall, bench, ceiling, floor or for mounting direct on machines. Also portable types.

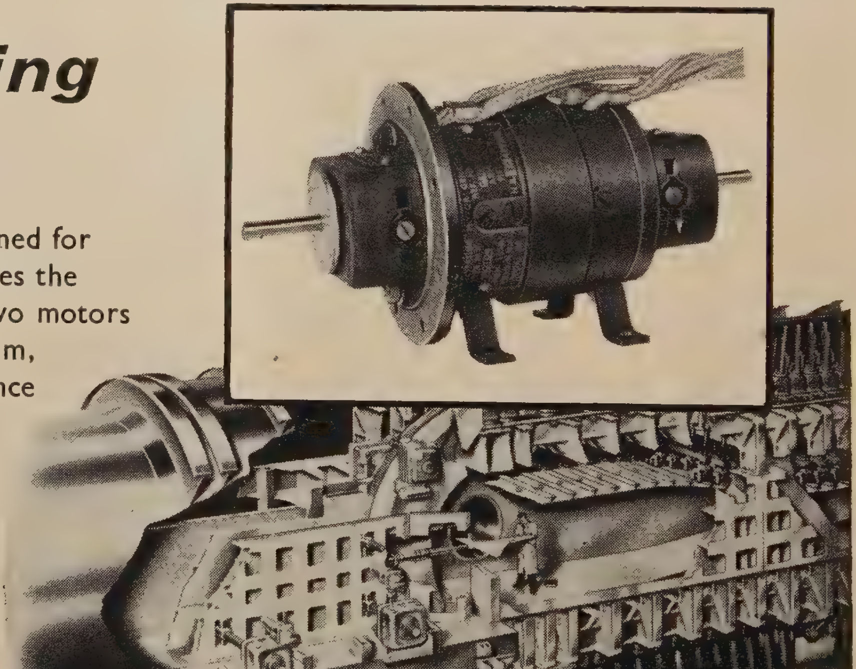
Catalogue sent free on request

MEK-ELEK Engineering Ltd., 17 Western Road, Mitcham, Surrey
Phone: MITcham 3072 Cables: Mekelek, London

What is NBD doing at MACH 2·8?

REGISTERED TRADE MARK

At the Bedford Wind Tunnel, designed for aerodynamic research up to 2.8 times the speed of sound, Newton Derby servo motors play a vital part in the control system, helping to determine the performance of Britain's future aircraft from still air to Mach 2.8.



- **Servo Motors**
- **Automatic Voltage Regulators**
- **Transistor Convertors**
- **Rotary Transformers and Convertors**
- **Motor Generator Sets**
- **Permanent Magnet Alternators**
- **High Frequency Alternators (400 to 3,000 c.p.s.)**

NEWTON DERBY

REMEMBER POPPY DAY

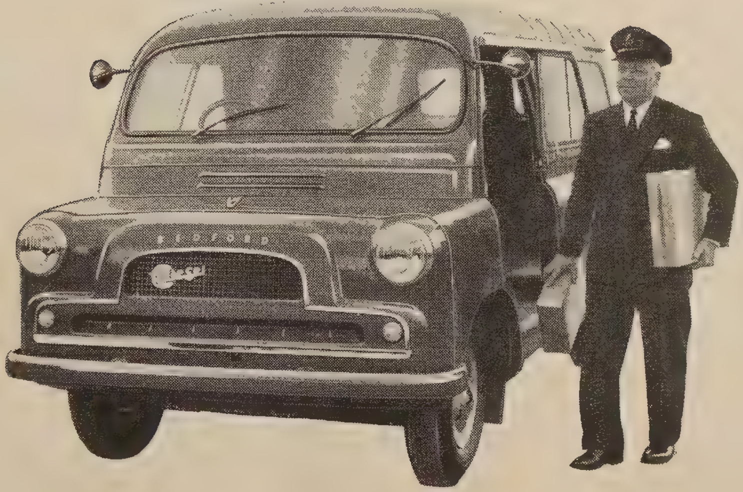
NEWTON BROS. (DERBY) LIMITED
ALFRETON ROAD, DERBY.
Telephone: Derby 47676 (4 lines) *Telegrams:* DYNAMO, DERBY
London Office: IMPERIAL BUILDINGS, 56 KINGSWAY, W.C.2.

And now-still

LOWER PRICES

for the thrifty

Bedford diesel van



First choice for the high-mileage operator

Van operators everywhere are welcoming these latest additions to the famous Bedford van range. Powered by the dependable, economical Perkins 4/99 diesel—a commendably quiet unit with little vibration—these rugged vans have a lively turn of speed and first-class acceleration.

The diesel engines are installed on the Bedford assembly line as regular production units, and the prices reflect the economies made possible by large volume manufacture.

Excellent service and low-priced parts are available from Bedford dealers everywhere.

Ask your Bedford dealer for full details and a demonstration.

TOP VALUE FOR MONEY IN DEPENDABLE DIESEL TRANSPORT

	10/12 cwt.	15 cwt.
90″ wheelbase van	£575	£585
102″ wheelbase van	£595	£605

£125 less in each case for the petrol-engined model

All prices *include* spare wheel and tyre

BETTER BUY

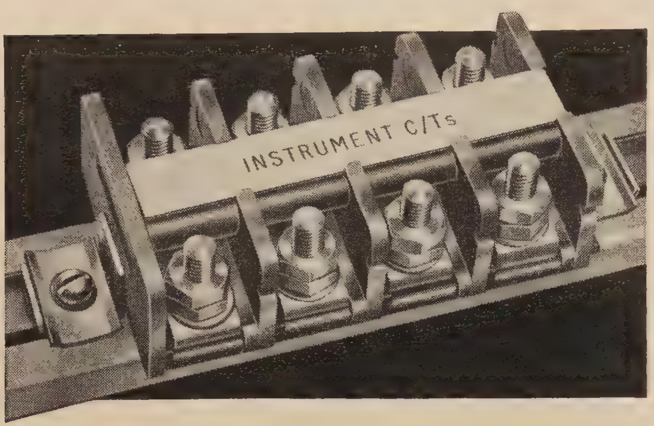
BEDFORD

Vauxhall Motors Ltd. Luton Bedfordshire

BETA

TERMINAL BLOCKS

IN MOULDED NYLON



- Designed for simple and economical grouping of any number of ways.
- Extra ways can be added without dismantling or further drilling.
- Only two fixing screws required up to 12 ways.
- Transparent covers and name strips available.
- Carrying capacity 20 amperes.
- Tested to 4000 V. between terminals and to earth.
- Available with 0 B.A. and 2 B.A. studs.
- Moulded in NYLON, highly resistant to tracking and virtually unbreakable.
- Approved by C.E.G.B.

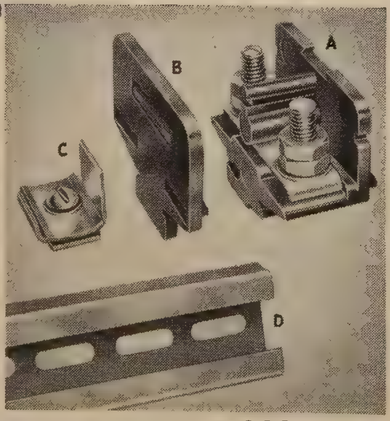
BASIC UNITS

A Body in moulded Nylon with brass connecting link with either 2 B.A. or O B.A. studs.

B Moulded Nylon barrier. Required only at one end of group.

C Cadmium plated steel end clamp, one required at each end of group.

D Cadmium plated slotted steel channel.



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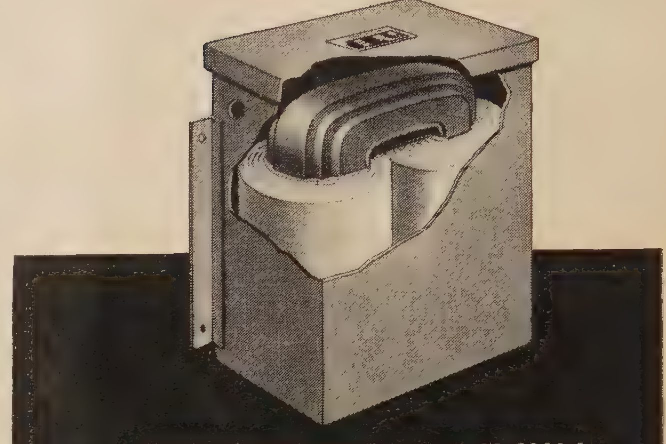

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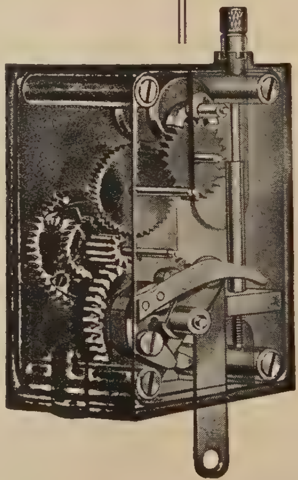

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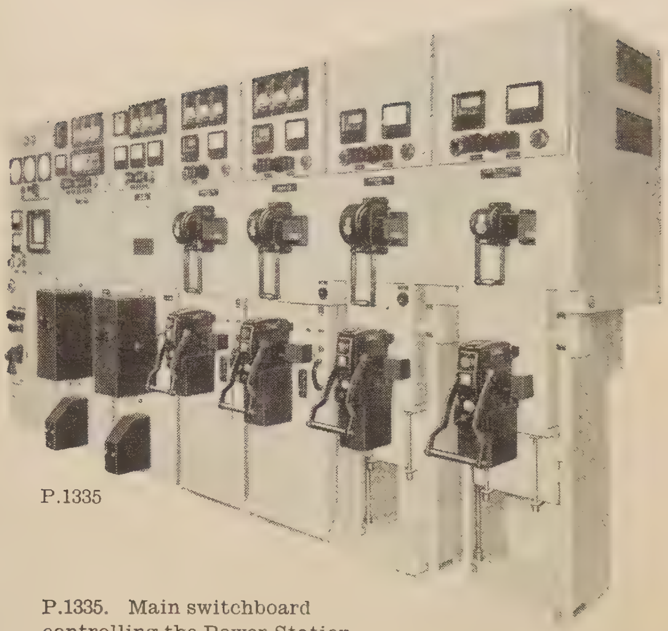

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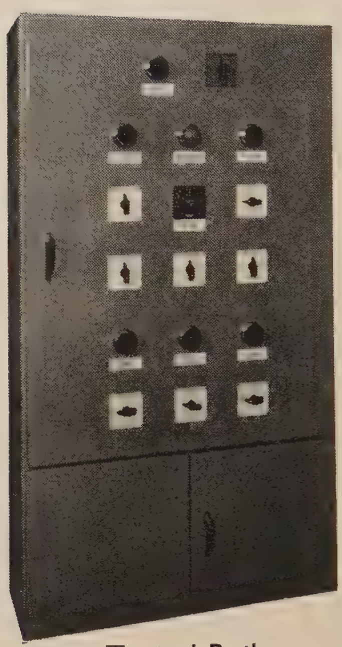

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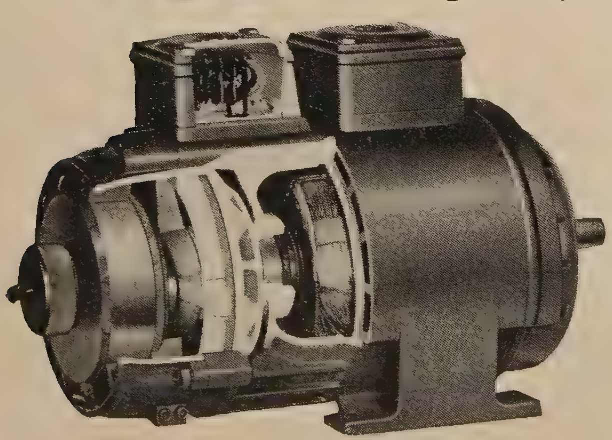
F59 with constant life-long braking torque



The new "F59" brake motor from Leroy is strong and versatile.

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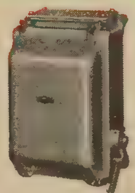

Simplex Monarch 500 volt 150 and 300 amp switches and fuse switch of robust all-cast construction suitable for heaviest duty.

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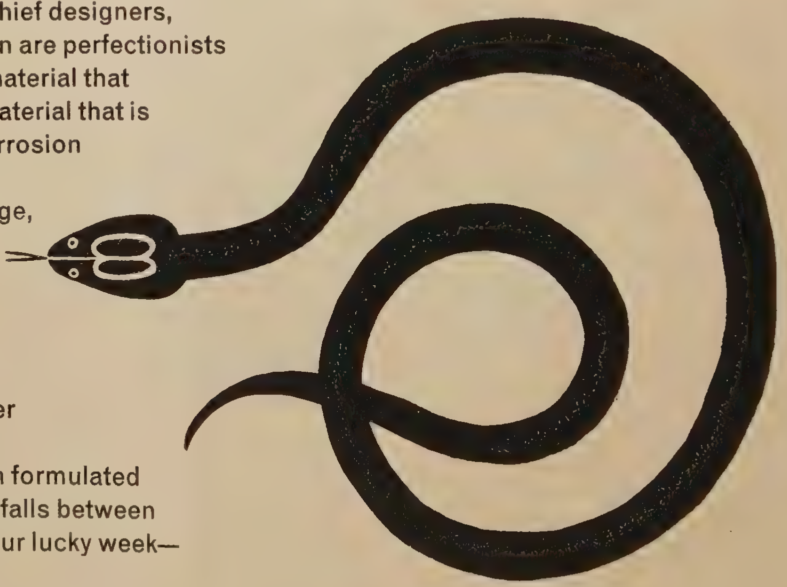
66.

Asp – sign of Tufnol



Those people born under the sign of the Asp swiftly slide into key positions as chief purchasing officers, chief designers, chief engineers and chief draughtsmen. Asp men are perfectionists who are always trying to get their coils round a material that combines the properties of many materials—a material that is light yet strong and hardwearing, resistant to corrosion and a good electrical insulator. They also expect this ideal material to resist deterioration in storage, to machine easily with ordinary tools and to be available in sheets, tubes, rods, angles and channels. Many Asp men have struck in the right direction by discovering this remarkable material—"ASP" brand Tufnol. They have also discovered that Tufnol is available in eleven other brands, each with pre-determined properties.
All brands of Tufnol are laminated plastics; each formulated to satisfy specific requirements. If your birthday falls between January 1st and December 31st, this could be your lucky week—the week you discovered Tufnol.
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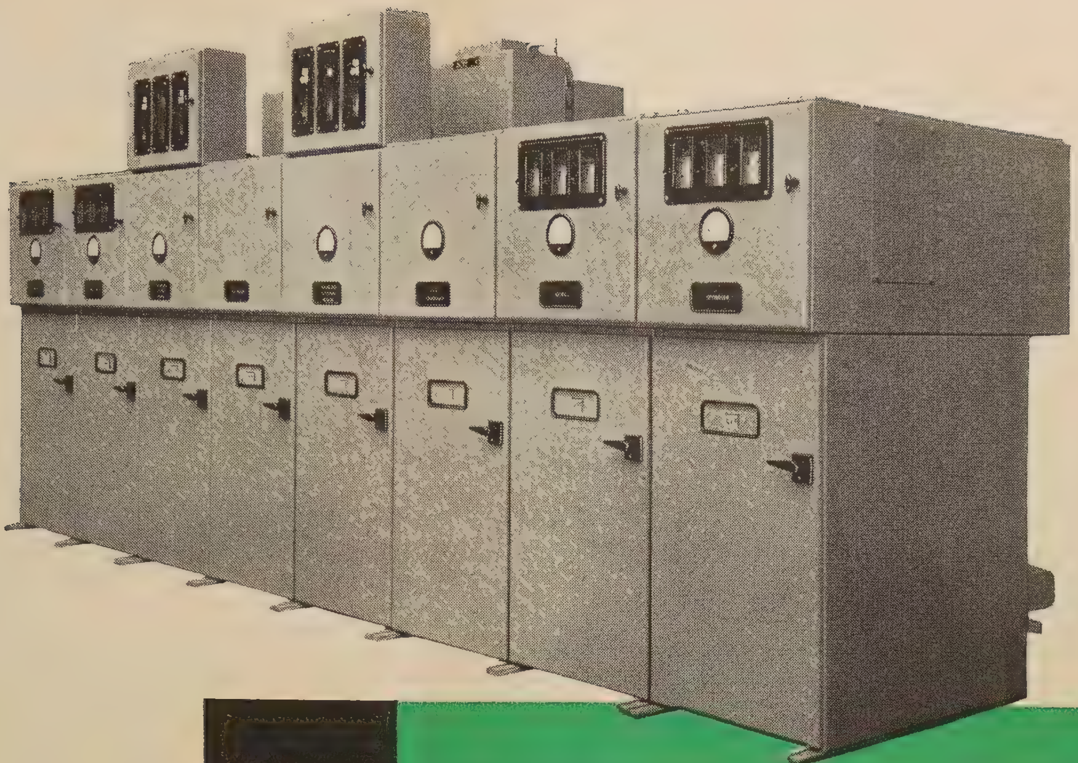
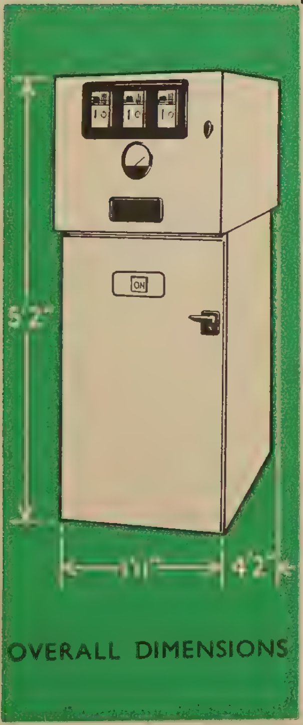
P4



CLASS LMT OIL-BREAK SWITCHGEAR



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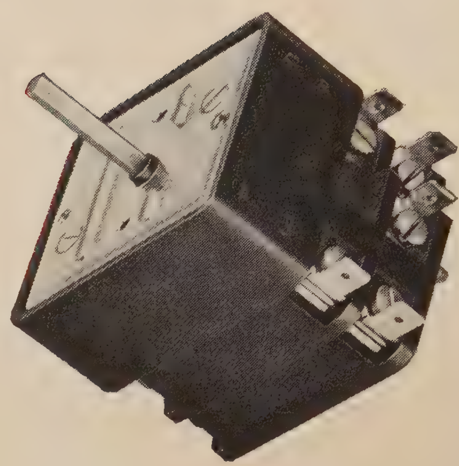

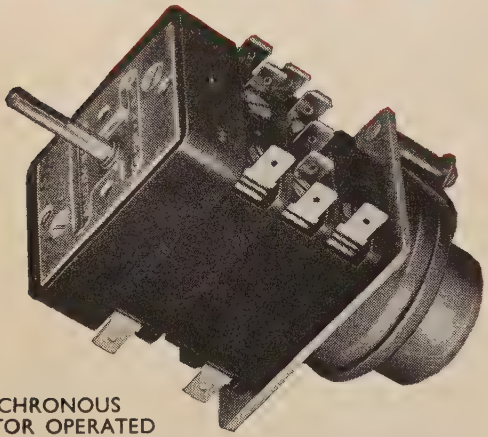

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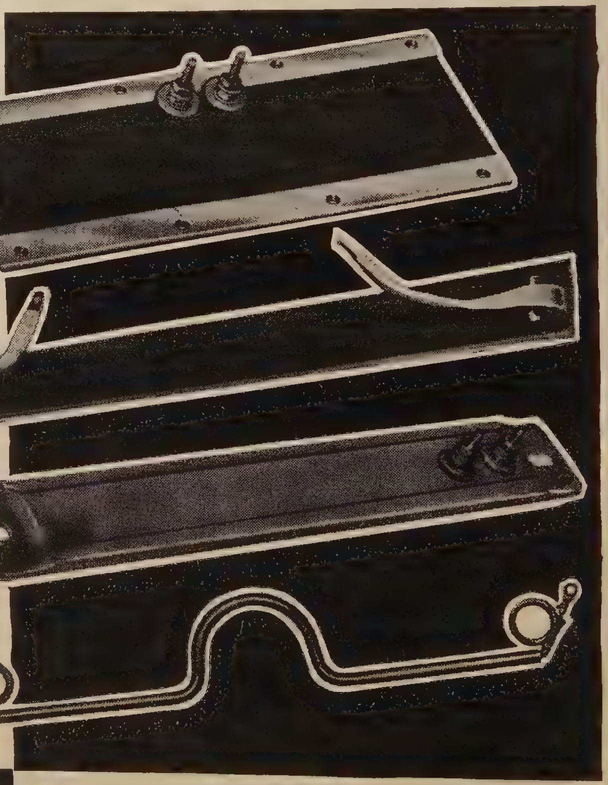

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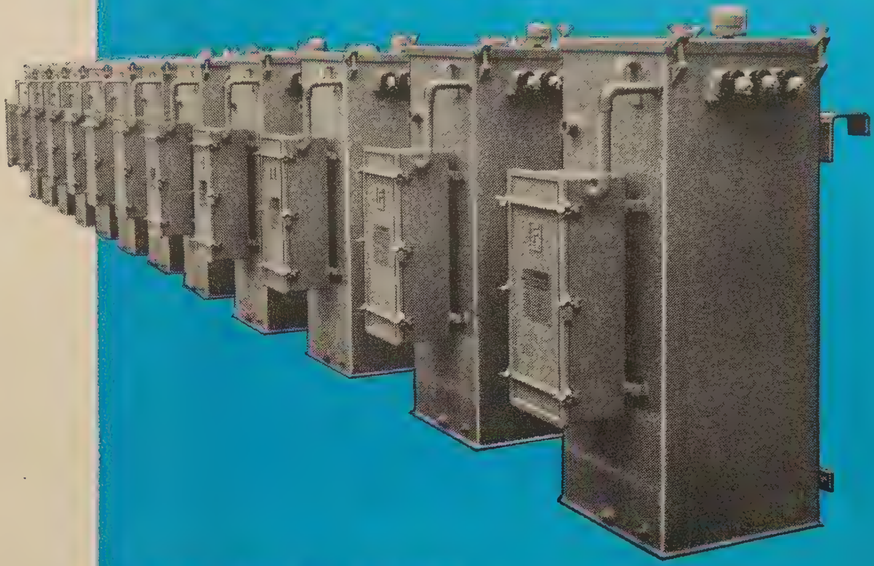

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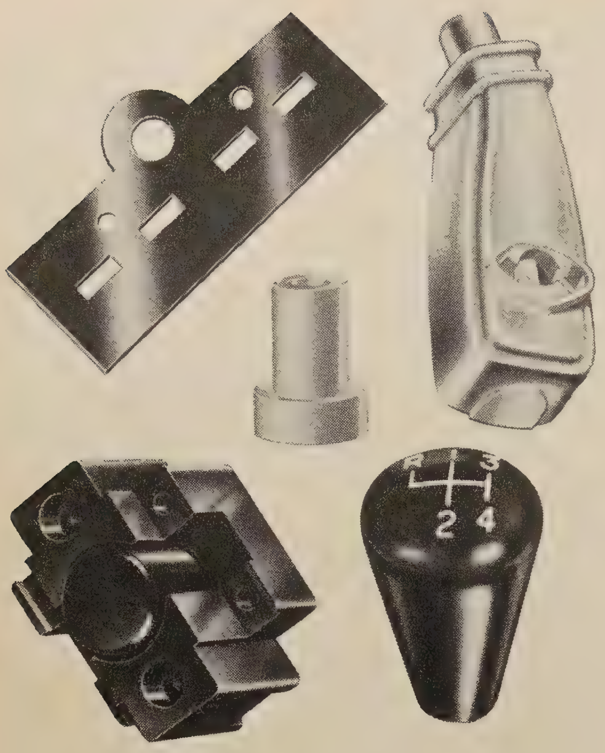

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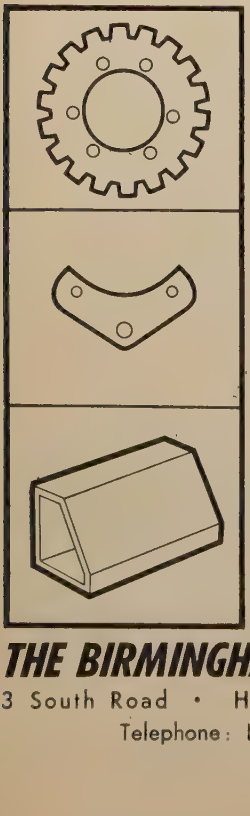

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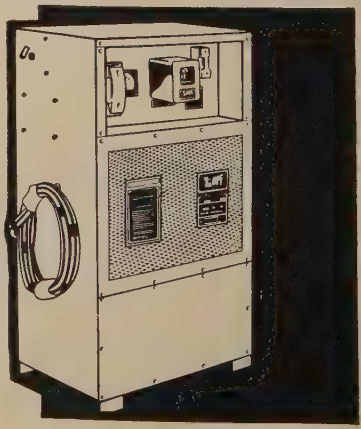

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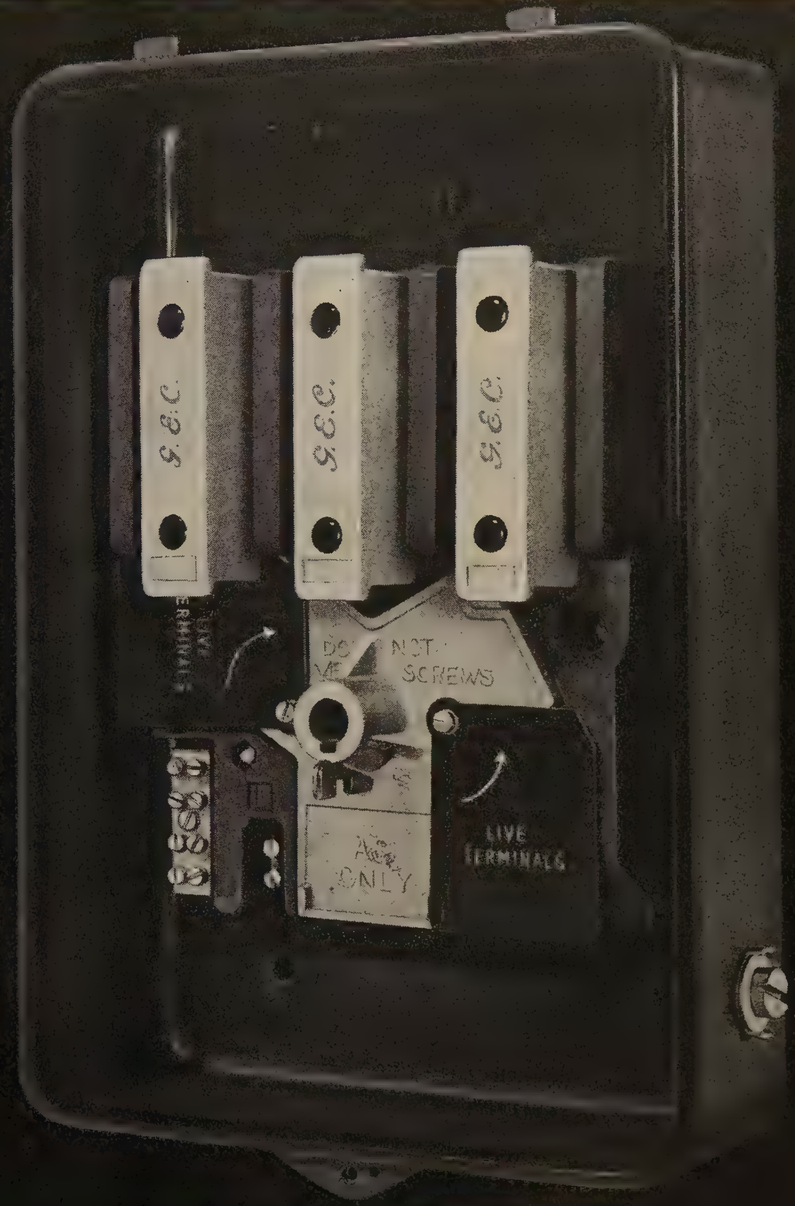

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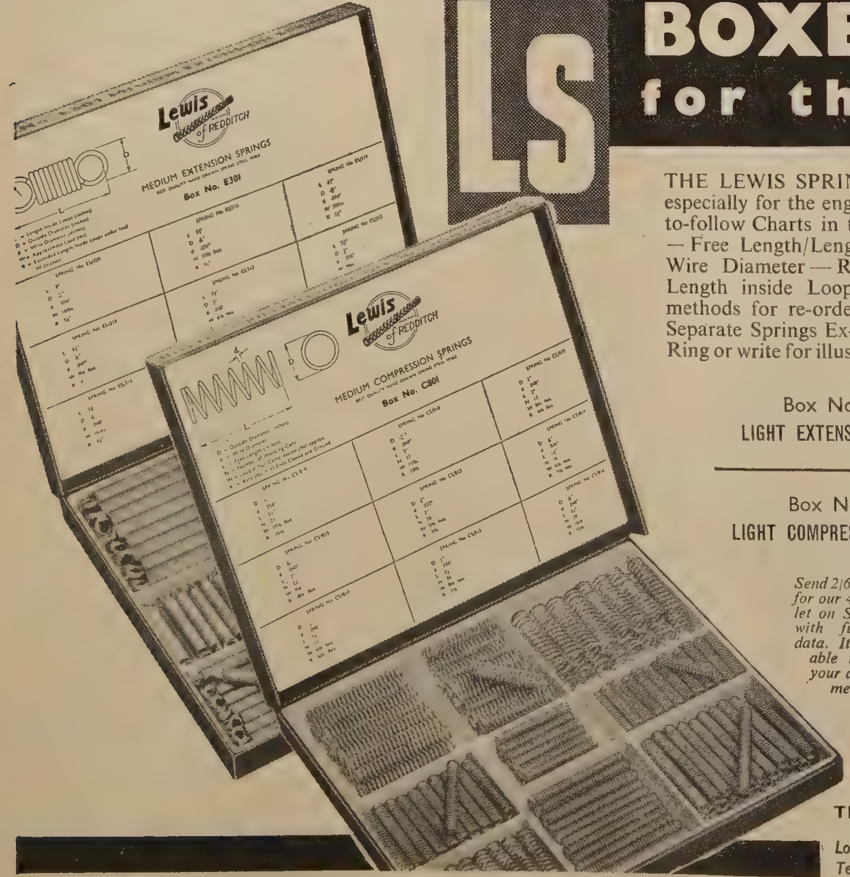

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A WORD OF ADVICE. When you order boiling plates, remember to obtain them from a member of the "Radiant Five." British manufacture is your guarantee of high quality.

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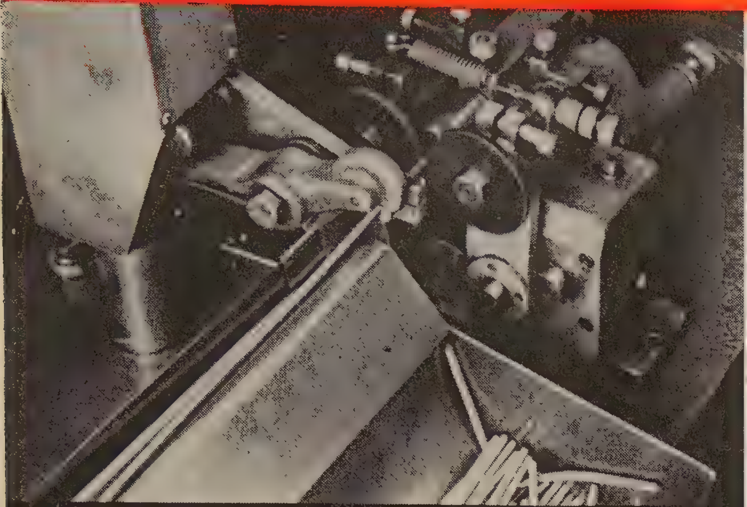
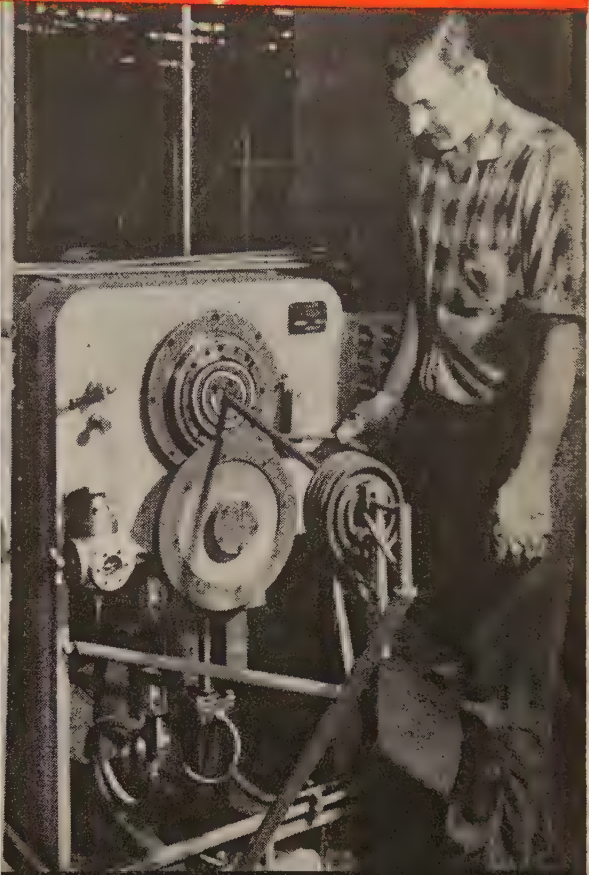


1 Automatic winding machine producing spirals of resistance wire to pre-set lengths for use in heating elements. The machine, once set, operates continuously.

2 Assembling the heating element components. The wire spiral is surrounded by a tube of metallic magnesium which is later converted to magnesium oxide.



3 Automatic coiling machine forms the element prior to compaction. In this case the heating spirals have previously been surrounded with magnesium oxide as insulation.

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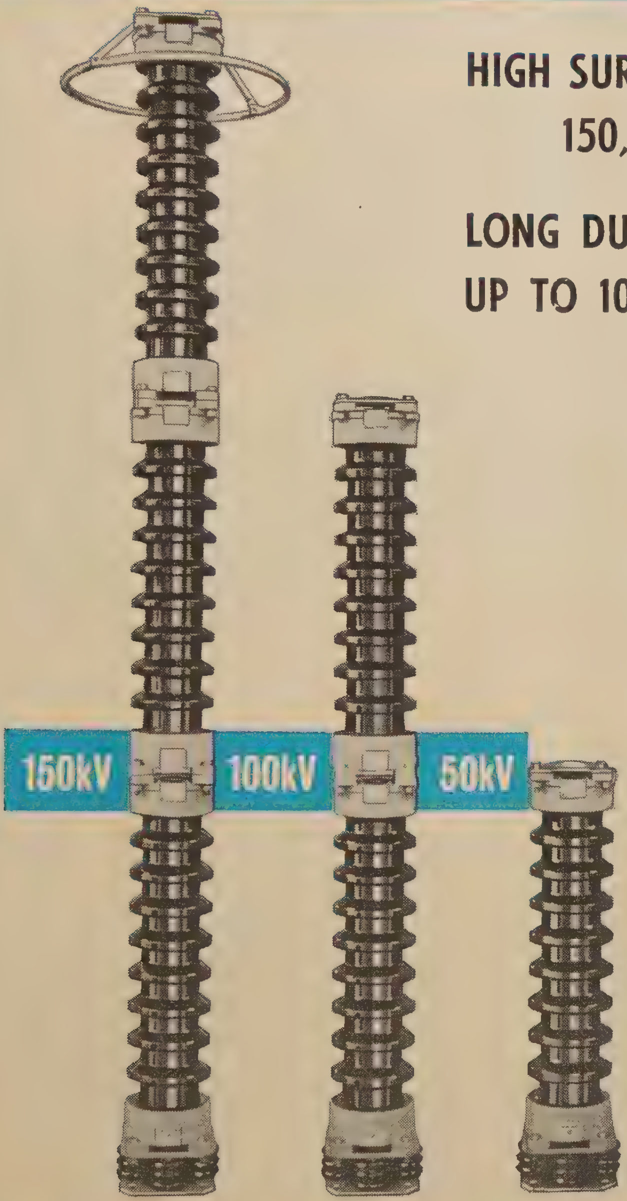

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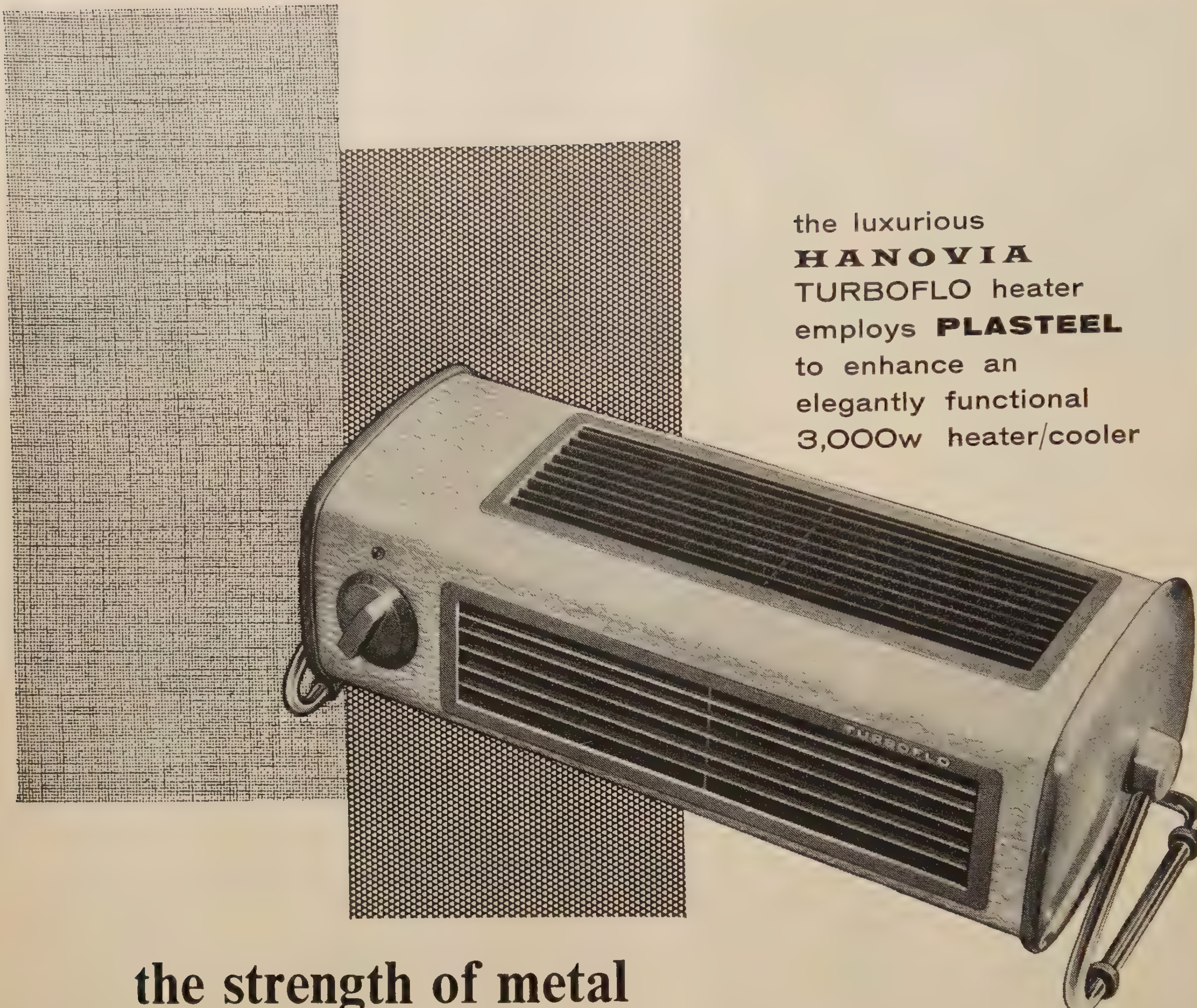

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3,000w heater/cooler

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married to the beauty and durability of PVC

The Hanovia Turboflo, shown above, is a typical example of the use made in the newest and most advanced designs of the latest metal finishing materials—vinyl plastic bonded to steel or aluminium. Named Plasteel and Plasminium, these new materials can be formed and deep drawn as easily as the basic metal and produce a finished article straight from the tools—saving the time and floor space taken for less modern finishing methods. In a basic range of attractive colours and designs, the plastic coating is also available in textured finishes such as wood and leather, and even in tartan effects. Plasteel and Plasminium are supplied in coils or flattened lengths ranging from ½″ to 18″ in width with metal thicknesses from 30 s.w.g. to 18 s.w.g. Write for full details and samples of new Plasteel and Plasminium.

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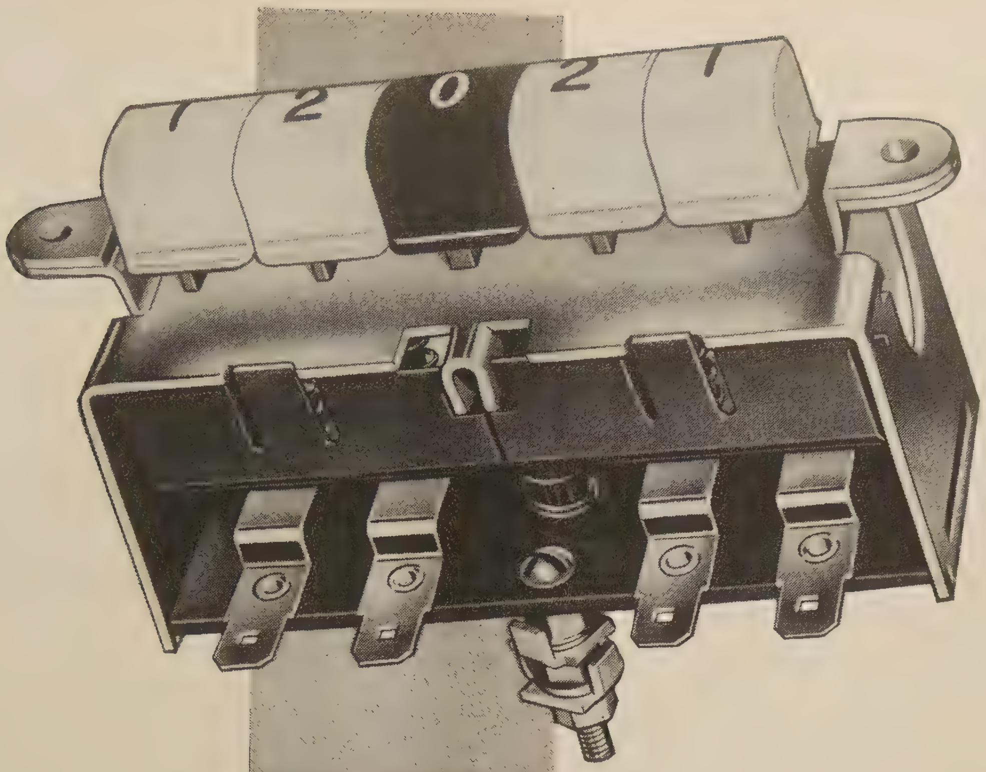

Carr Push-button switches

SOLVE YOUR MULTI-SWITCH PROBLEMS IN TWO WAYS

ECONOMY. The use of one push-button switch instead of several switches considerably reduces purchase and assembly costs.
APPEARANCE. Their modern styling adds eye appeal to any product—another sales advantage for your appliances.

Carr Push-button switches are intended for use where one to four circuits must be operated from one neat control panel. Designed for single or double pole circuits with common "off" button, they allow one or two circuits to be closed by a single action. Tests have been carried out to more than 250,000 on/off cycles without fault.

Typical applications are for fan heaters (where vari-heat and speed control are required); washing machines (particularly heated models); electric cookers; cleaners, and, in fact, any appliance which calls for variable control at the touch of a button.

For more details of this versatile unit, please write or call any of the offices listed below.

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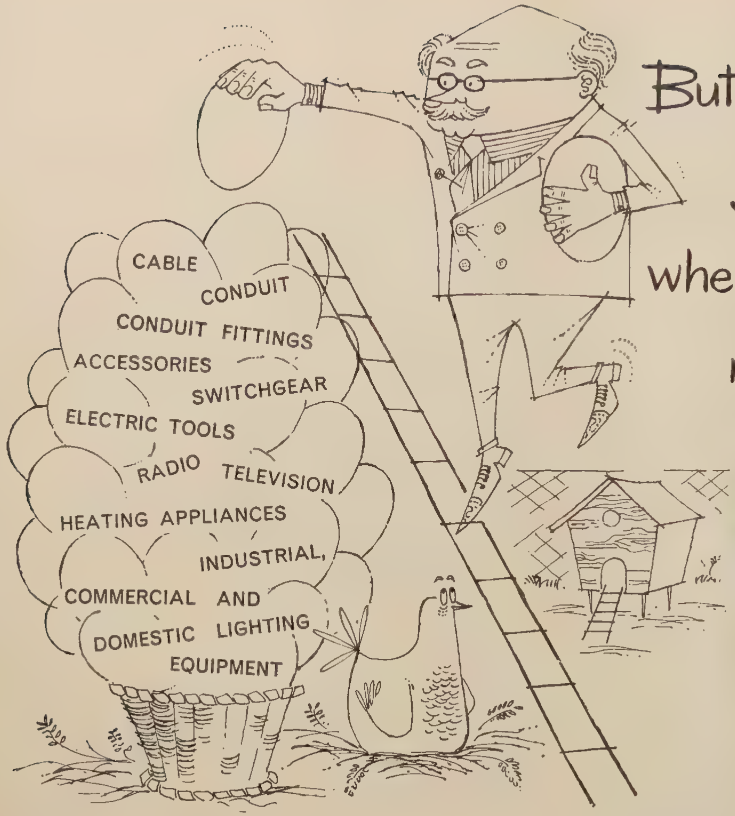
Stapleford, Nottingham Phone: Sandiacre 2661 Telex 37637
London: 195-197 Gt. Portland Street, London, W.1. Museum 9361.
Manchester: Sunlight House, Quay Street, Manchester, 3. Blackfriars 2533.
Birmingham: Silhill House, 2235 Coventry Road, Sheldon, Birmingham, 26. Sheldon 5208-9.
Glasgow: Baltic Chambers, Wellington Street, Glasgow, C.2. City 3202.



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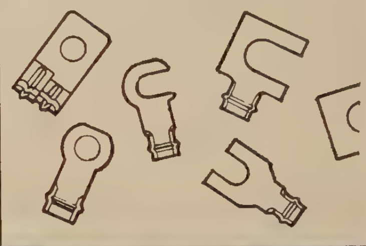

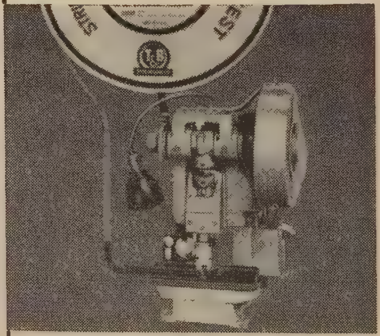

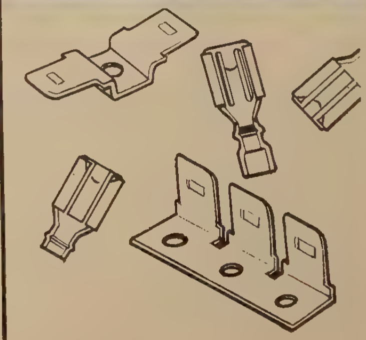

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T&B-KENT Strip-fed attaching machines

Very rapid, very robust — capable of over 4,000 terminal installations per hour.

T&B-KENT Male tabs

A full range covering *all* sizes of terminals—various angles, and flat—single and multi-tab. Male Tabs are supplied loose but those with wire and insulation grips are supplied in strip for automatic attaching.

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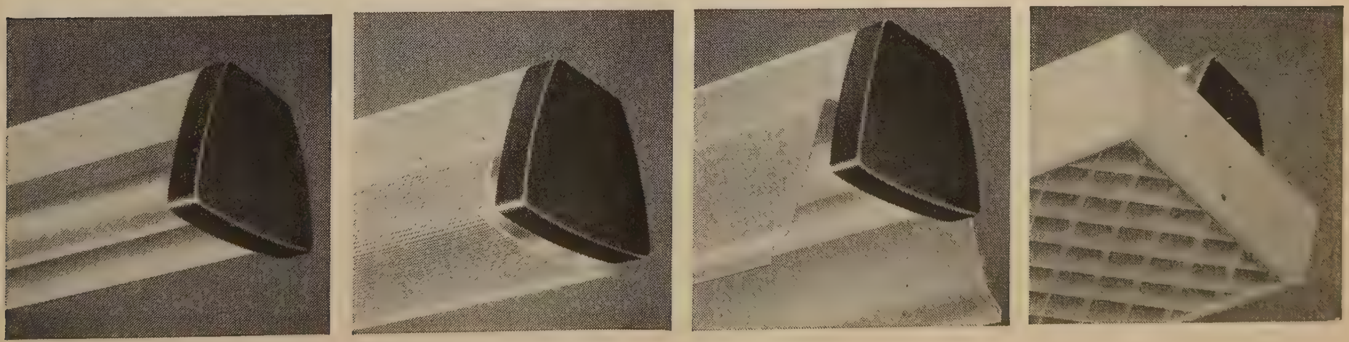

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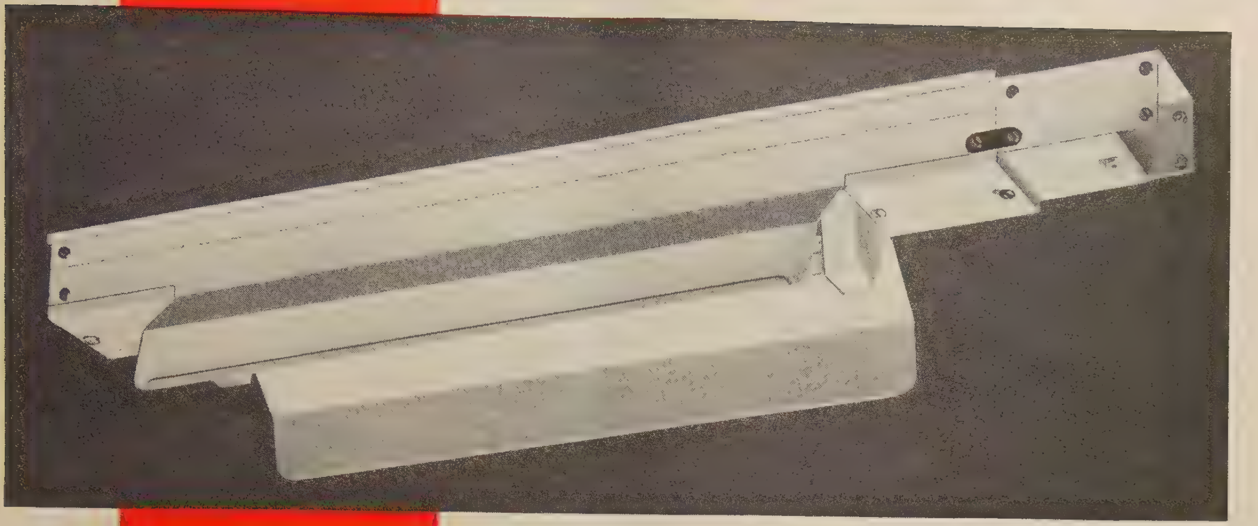

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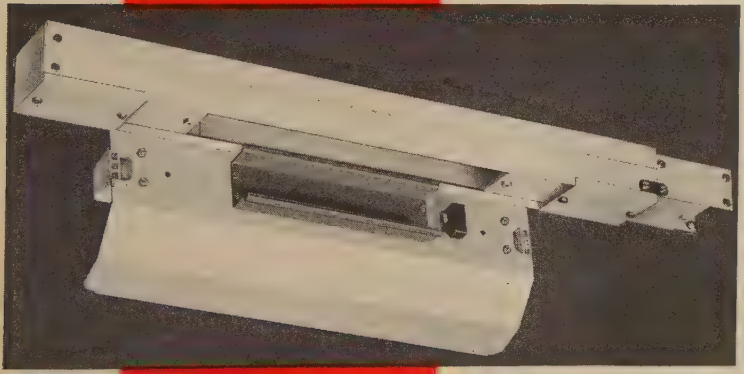

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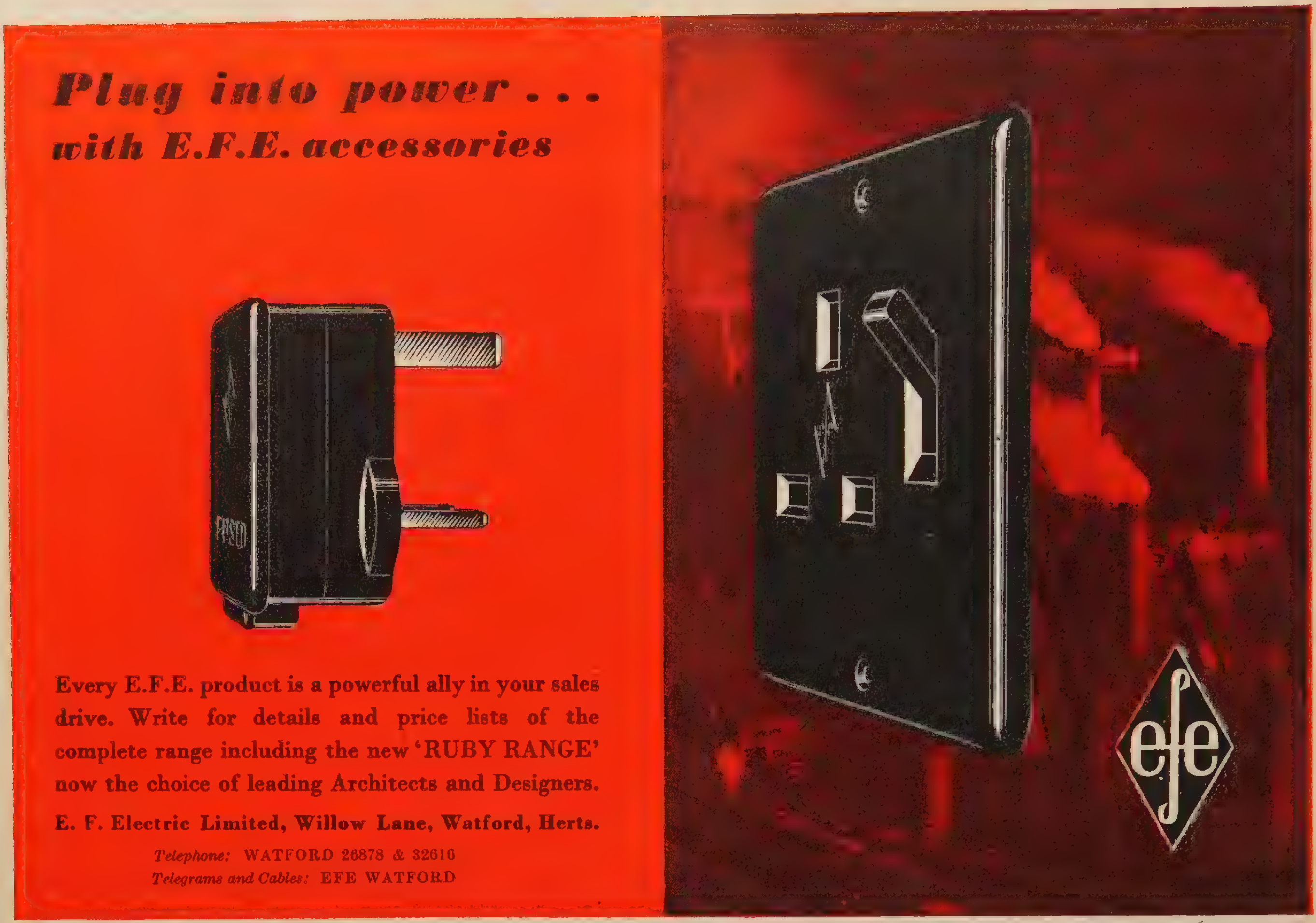

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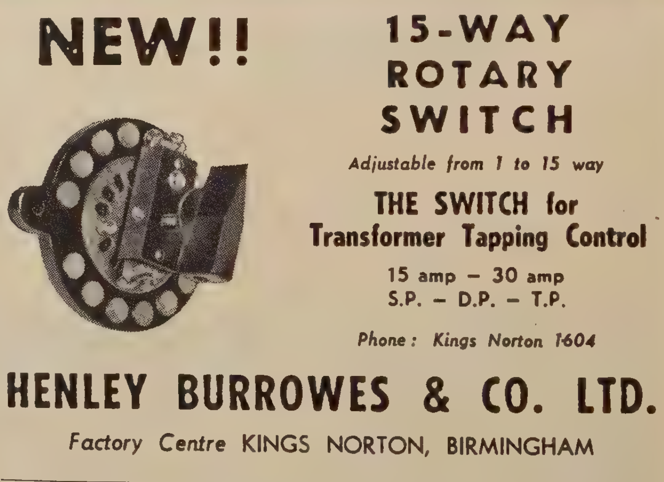

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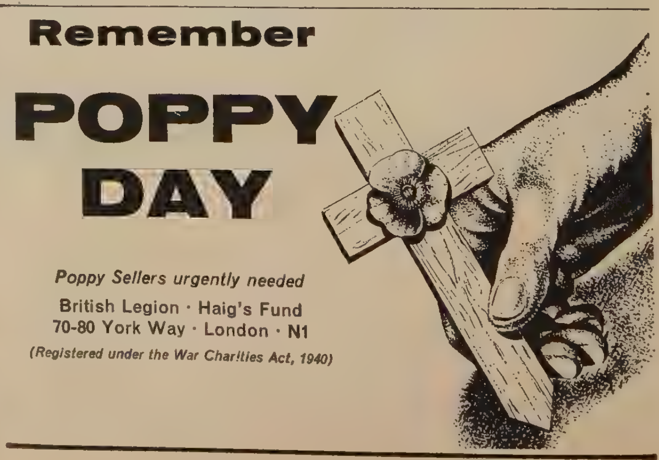

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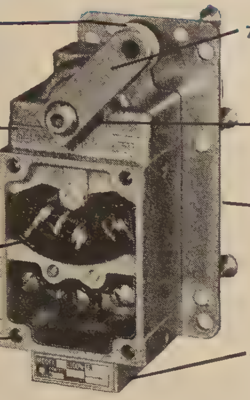
MODEL L100W *heavy duty*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STURDY GASKETED HOUSING AND SHAFT —DUST, OIL AND WATER TIGHT
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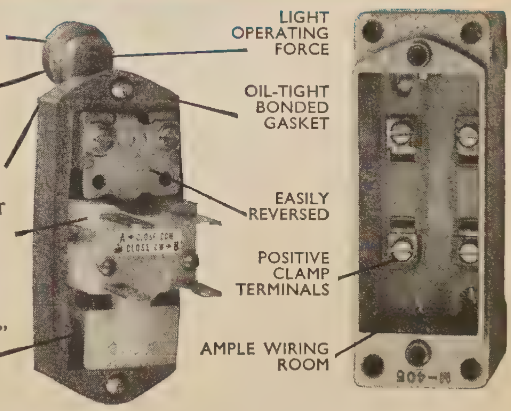
AMPERE RATINGS

	Normal		Inrush
VOLTS	AC	DC	AC
125	30	5	60
250	15	2	30
Three circuit switches rated to 300 volts only Two circuit switches rated to 600 volts			
500	7.5		15
600	6	.4	12

MODEL M *precision*



LONG MECHANICAL LIFE Heavy duty nylon latch mechanism. Tested to 45,000,000 cycles under electrical load.

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VOLTS	AC	DC	AC
125	20	3	60
250	15	1.5	30
500	7.5		15
600	6	.4	12

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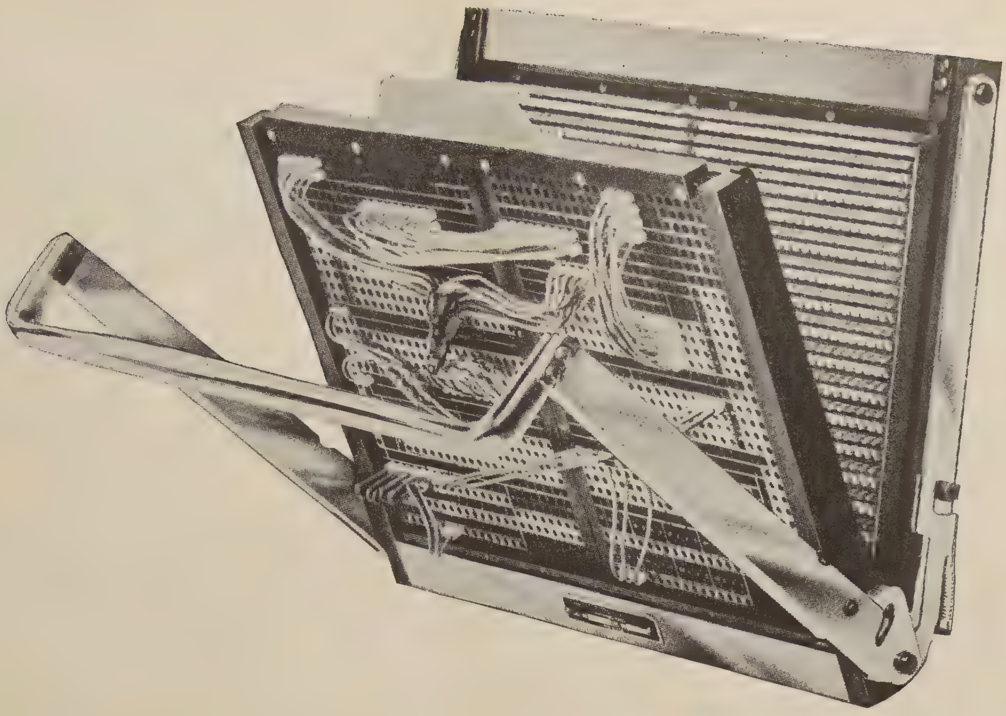
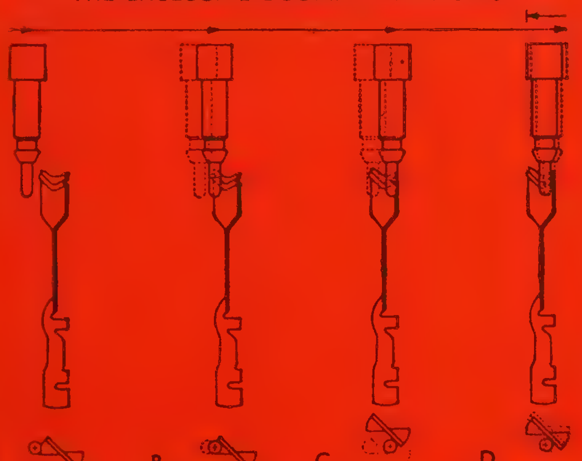


A move in the right direction

THE EXCLUSIVE DOUBLE WIPE ACTION



A Relative positions of pin and contact before closing operating handle—no contact at this point.

B As operating handle is engaged, pin moves along to touch chevron on contact spring.

C Pin traverses chevron to point of maximum travel, wiping both pin and contact.

D Pin moves back from point of maximum travel to rest in previously wiped position.

The essential dependability of A-MP programming systems is ensured by the double-wipe action which cleans contact surfaces as they engage. The unique design provides contact engagement by a lateral locking movement of the entire removable patchboard so that contact pressure is consistent, and pins cannot be displaced. Note the special chevron shape of the contacts, providing 0.090″ of wiping action with only 0.060″ pin travel.

Other advantages of A-MP patchboard systems are:

Remarkable flexibility of switching arrangements.

Contacts made and broken by cam action of frame.

Double wipe action precleans contact springs.

Contact resistance stable down to low microvolt levels.

Consistent contact pressure, irrespective of number of connections.

Range covers 240 to 5304 contacts, in various materials.

Standard range of pluggable leads covers all lengths and configurations.

*A-MP PROGRAMMING SYSTEMS

A-MP

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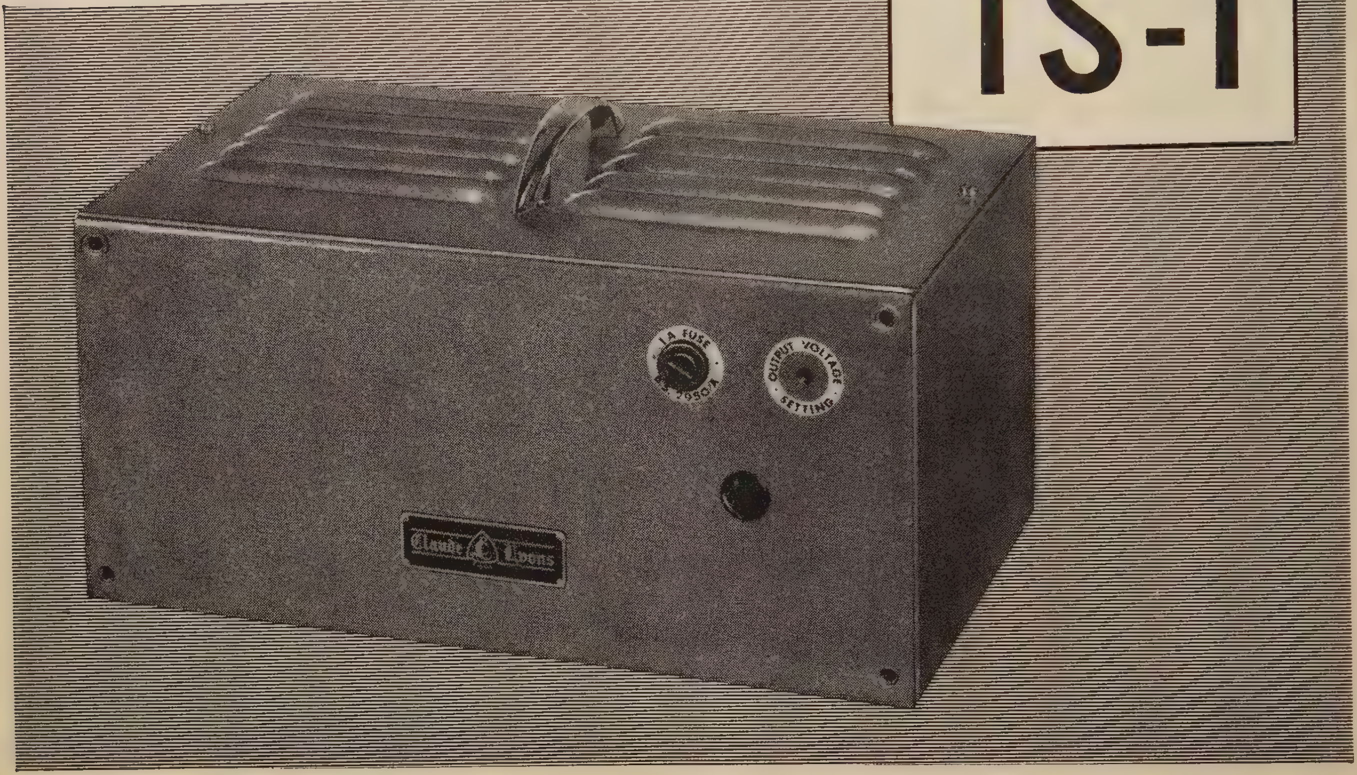
AP 190

A BRILLIANT NEW

1 kVA VOLTAGE STABILISER

TYPE

TS-1



FAST	40 volts/sec correction speed
ACCURATE	Better than ±0·5%
RELIABLE	Transistorised control unit—no valves or relays

The TS-1 is something entirely new in the field of A.C. voltage stabilisation. This light and compact 1 kVA unit provides rapid, accurate and distortionless stabilisation over an input voltage range of 25%. Alternative connection gives 2 kVA output with 12½% input range.

Output is unaffected by variations in supply frequency, load current (zero to full load) or load power factor. Indoor tropical rating is standard. Cabinet model (readily adaptable for wall or chassis mounting) or rack model.

PRICE—ONLY **£69·10 net**

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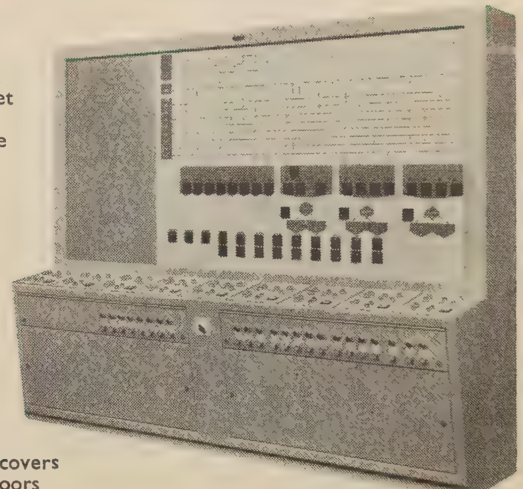

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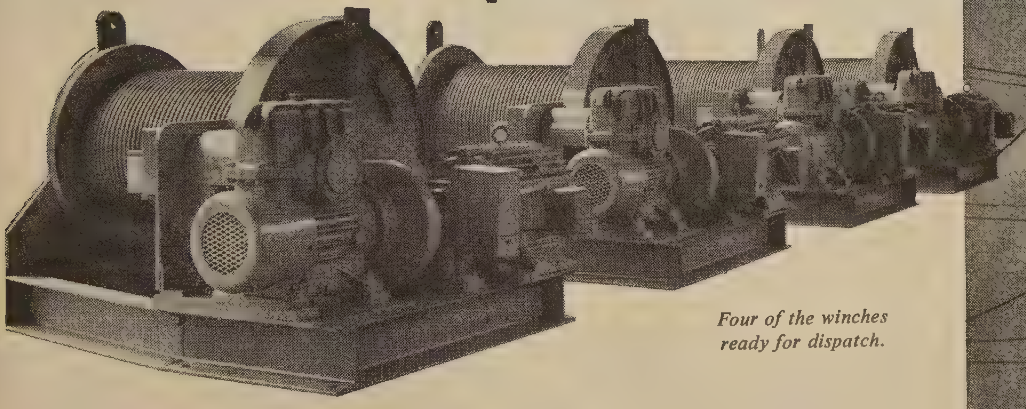
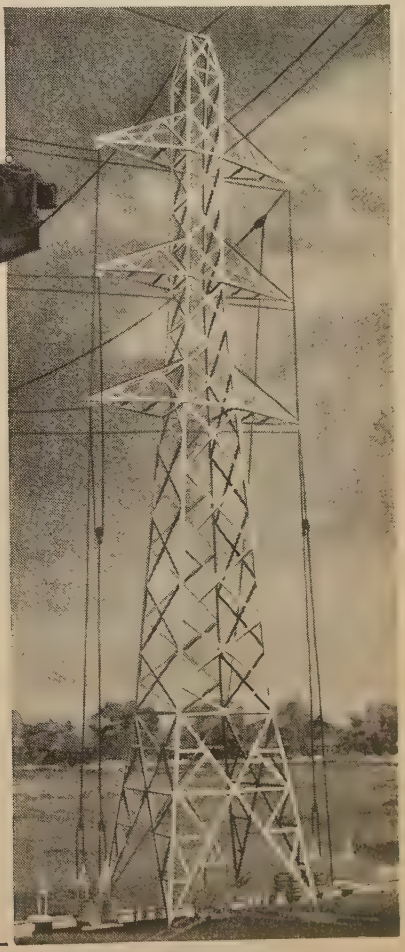


Four of the winches ready for dispatch.



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L.E.F. winches were selected because they are precision-built and completely reliable under all conditions. They are used for big jobs, and, small by the great names in British Industry.

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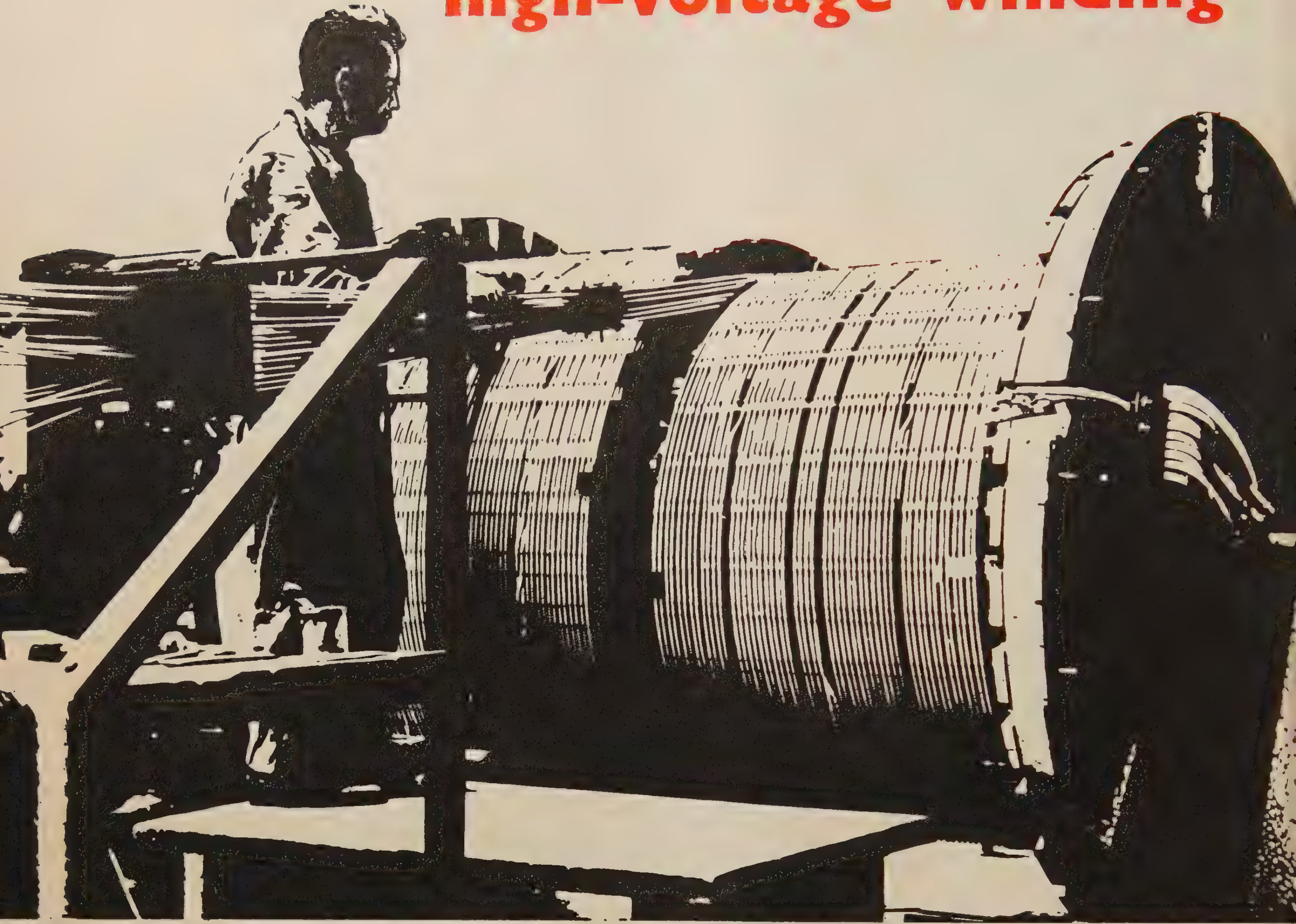
high-voltage winding



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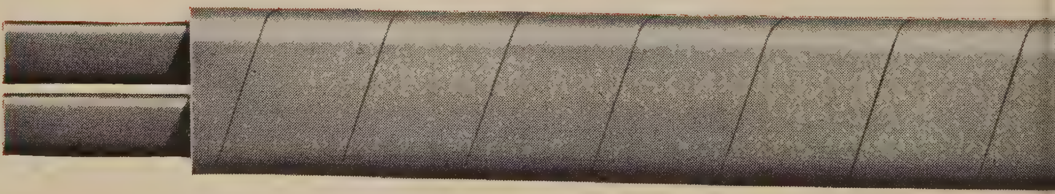
BICC Paper Insulated Strip on a Transformer at Brucė Peebles & Co. Ltd., Edinburgh

BICC PAPER COVERED STRIP



As a result of the development and installation of paper lapping plant of revolutionary design BICC Paper Covered Strip is now manufactured with a high degree of controlled registration of papers and is especially suitable for high-voltage transformer windings immersed in oil. The high quality paper covering can be applied to any practical rectangular section and caters for a wide range of requirements.

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It's a fact! 197 Different solders. There's low melting point solders — solder wires — high temperature solders — solders for silver ceramics — body patching solders — spray gun solders — electrical solders — tinplate, steel, zinc solders and many more besides.

...not now - it's 198!

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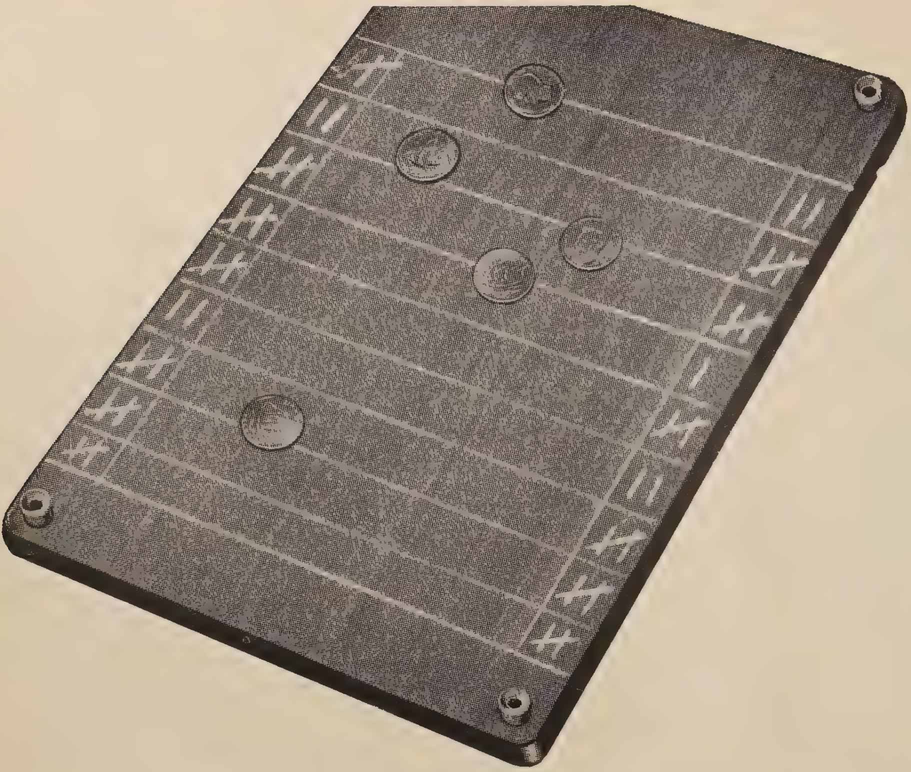

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Obviously, when they're Wootton-made, and Wootton-tested. Made from the best plywood Wootton could lay hands on. Tested for reliability . . . toughness . . . durability. Wootton meter boards stand up to anything. No contraction or expansion warping with Wootton! Oh, and there's more to Wootton than just meter boards. They make wood blocks too, and instrument cases, and they're brilliant at sunk switch boxes.

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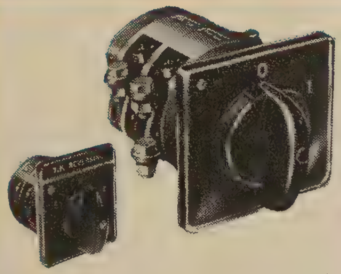
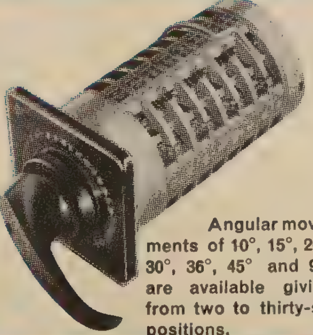
TSL
...the BEST

All your switching requirements are met by the BLUE LINE range

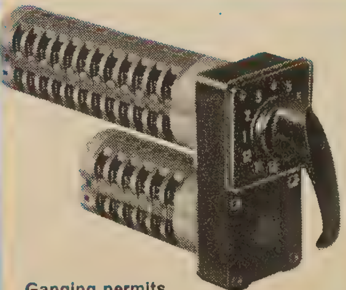
The unique construction of Chilton Blue Line Rotary Switches enables rapid assembly of custom-built switching arrangements for any duty, and permits complete standardisation of switching in customers' products. Up to 200% increase in multi-circuit control capability from a single switch is possible, with economy of space and great reduction in component costs.



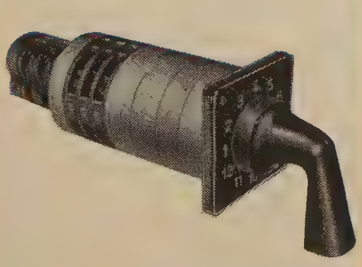
Six sizes with load ratings of 10, 20, 40, 60, 100 and 200 amperes. Higher ratings are available for certain applications.



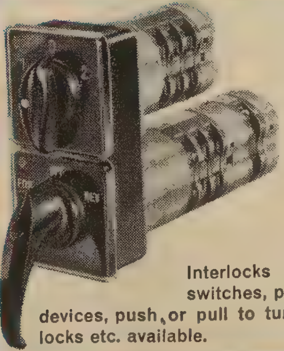
Angular movements of 10°, 15°, 20°, 30°, 36°, 45° and 90° are available giving from two to thirty-six positions.



Ganging permits operation of up to 96 contacts from one operating handle.



Switches of different ratings may be joined together as a single assembly



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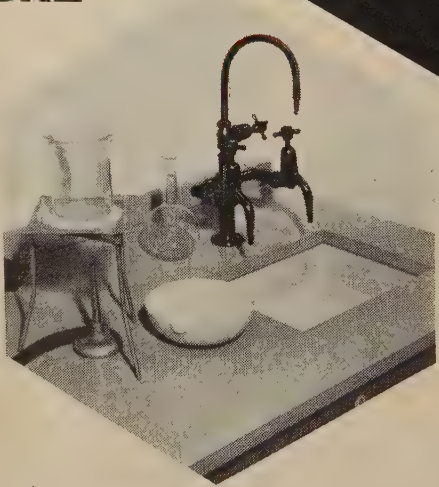

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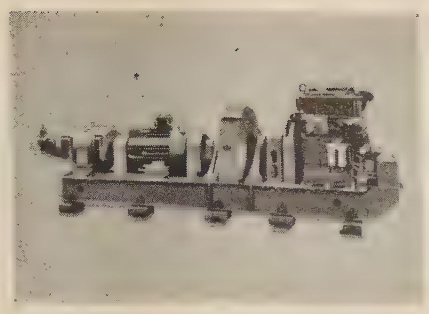

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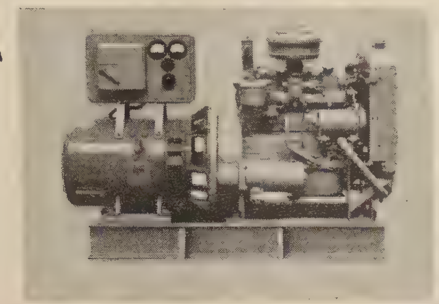

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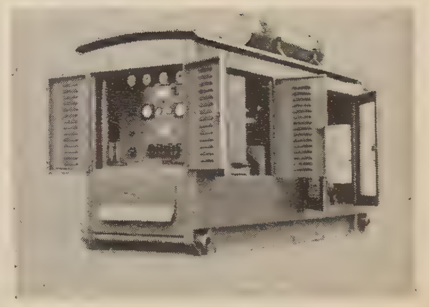

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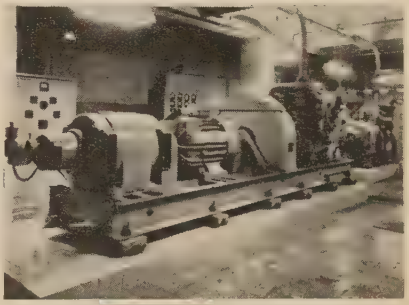

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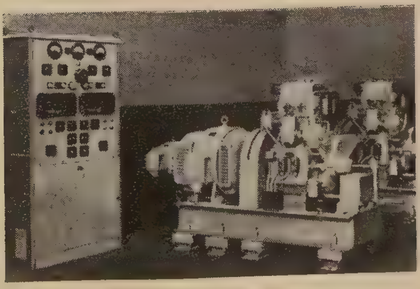

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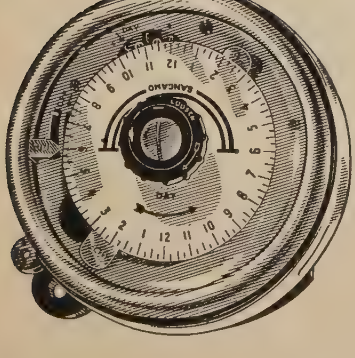

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ELECTRICAL REVIEW

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Transformers from Canada

THE Committee of Inquiry into the Electricity Supply Industry (the " Herbert Committee ") which reported in 1956 to the Minister of Fuel and Power made a number of observations on the purchasing arrangements of the Central Electricity Authority in respect of heavy electrical plant. It was considered that although the Authority might be regarded as a monopoly buyer, in actual practice its freedom of bargaining, by obtaining competitive tenders, was severely limited by the lack of real competition between manufacturers.

Four possible courses were then said to be open to the Authority : to accept the situation and pay the price; to get round trade agreements and practices in various ways; to go abroad for its requirements; or to manufacture plant itself (which it had power to do under the 1948 Act). The last-mentioned course was thought to be not very practical or economical.

On the subject of purchases overseas the C.E.A. had told the Committee that it would be unwise for the electricity supply industry to be dependent upon foreign manufacturers for spares and maintenance. It also suggested that the Government would look with disfavour upon any proposal by the Authority to go abroad for heavy electrical plant. Although the Committee realised that the national interest might require purchases to be confined to this country, it " understood " that the Authority had never endeavoured to ascertain what the Government's policy was in this matter. Accordingly it recommended that " the Electricity Boards should seek the best and cheapest plant, taking maintenance and servicing into account, irrespective of origin."

That was over five years ago. Since then conditions in the manufacturing industry have greatly changed, partly as a result of the activities of the Monopolies Commission and the Restrictive Practices Court, and partly because of the changed economic circumstances. Moreover, a new authority has supplanted the C.E.A.—the Central Electricity Generating Board—and there has been a great increase in the scale of operations (particularly in the size of plant).

Rightly or wrongly the C.E.G.B. has thought that in one direction, i.e. transformers, it is not being fairly treated by the manufacturers, particularly in view of the Restrictive Practices Court's ruling this year against the transformer makers' agreement. It has therefore decided to order two 90 MVA transformers from the Canadian General Electric Co., which is associated with the American General Electric Co. It may be presumed that the price is favourable to the C.E.G.B. and it is to be hoped that it is not below the Canadian "home" level. (Actually that level has been depressed in recent months.) There will be no import duty on these transformers, as they are coming from a Commonwealth country.

It is difficult to question the propriety of the Generating Board's action when British manufacturers expect overseas markets to be open to them. But it is still a tenable belief, though sometimes questioned, that export trade depends upon a reliable home market. The C.E.G.B. can claim justification for any attempt to secure cheaper plant but other national considerations are involved. It should be possible for the Board and the manufacturers to arrive at agreements whereby the Board will be able to obtain its transformers (and other equipment) at prices which it regards as reasonable and at the same time will provide an adequate margin for the producers.

WHO PAYS?

The responsibilities of industrial management are becoming increasingly more complex, but the higher educational system in this country has not kept pace with the changes that have occurred. This is the judgment of the F.B.I. Education Committee which recently submitted evidence to the Committee on Higher Education set up by the Prime Minister last December. The F.B.I. says that industry sees its greatest need in the recruits that have profited from a well organised and more prolonged period of broadly based education. Much of this education must be closely associated with the industry in which the student is to be employed if he is to be effectively and quickly absorbed into gainful employment.

At present, this association is fostered by a considerable financial investment by industry in education and training. The F.B.I.'s report states that there is undoubtedly a feeling in many industrial circles that this is an expenditure rather than an investment and, should economies be necessary, this is one of the first areas where it might be exercised. This means that at a time when investment should be highest, so that further recoveries might be accelerated, financial aid for education could well be at its lowest. The F.B.I. considers that this tendency is likely to make itself particularly felt in the industrial training associated with college-based sandwich courses. Works-based courses are supported mainly by the larger companies and it is considered undesirable that too many students should be tied in this way. Consequently it would like to see an expansion of the numbers of college-based students and an extension of responsibility for their training throughout industry. To achieve this, it is considered that some incentive is needed which could be by means of grants covering not only education but also industrial training. Another suggestion is that the Government should reimburse industry for the effort it makes in increasing the national reserves of industrial talent by taking in college-based students who, for the most part, will not remain with the firms which have trained them.

LIGHT IN THE OFFICE

Given the opportunity, most people would choose to work with a level of artificial lighting that is twenty times the average at present found in offices in this country. This surprising fact was discovered in experiments carried out by the British Lighting Council and it emphasises how little danger there is yet of providing too much light. As we pointed out in our recent special lighting issue (8th September), there is an extraordinary gap between technical achievement and application in lighting. This presents a formidable challenge to the electrical industry in a field where it has now a virtual monopoly. But competition for a share of consumers' total expenditure is acute.

The proposed legislation on office lighting is a major step forward though the eventual regulations under the Act will merely define minimum standards. These may be only half the level (30 lm/sq ft) recommended by the Illuminating Engineering Society and far below the American standard (100 lm/sq ft). It is therefore incumbent upon manufacturers of lighting equipment to see that those concerned are properly informed about the social and economic advantages of a truly modern installation. The excellent booklet *Better Office Lighting* produced by the British Lighting Council shows that its present campaign has been well thought out with a careful blend of exhortation and technical fact. The benefit of having more light in the office will be small if installations are not expertly designed.

STRIKE THREAT

Having failed to secure the increase in wages they asked for, and rejecting an offer made by the employers, the trade unions with members in the electricity supply industry are contemplating a stoppage of work. The claim was for £2 a week more; the offer was considerably below this figure and the proposed increase was spread over four years beginning next April.

There is considerable doubt about the legality of a strike in a public service of this kind and in any event agreements in the industry provide for arbitration. If the matter goes to arbitration there seems to be ample room for manœuvre between the employees' demand and the employers' response.

Ultimately there will be some kind of increase and this, combined with the obligation on the Boards to meet a large part of their capital expenditure from revenue, must inevitably be reflected in higher charges to consumers.

Reducing Grid Maintenance in South Scotland

By G. S. WILTON, B.Sc., A.M.I.E.E.*

A great deal of work has been done by the South of Scotland Electricity Board and its predecessors to keep down grid maintenance costs. This article describes the organisation of this work, some of the more interesting items of equipment which are employed, and the way in which they are used

WHEN the 132 kV grid system was built great emphasis was placed on frequent stringent inspections and prompt repair of all faults. Great care was taken to obtain such standardised gear as was then available in order to achieve speedy and inexpensive maintenance and repair. This was so successful that in Scotland a very small headquarters staff, with five section engineers and about 34 men, were able to carry out this work with little additional outside assistance, until the mid-war period. This staff dealt with all types of grid faults, including lightning and other faults on transformers, those even necessitating rewinding and drying out on site, also large-scale line faults after excessive ice loading, 33 kV cable faults, and major switchgear failures. Although the headquarters and section staffs were kept busy, there was time to carry out grid transformer changes, build temporary grid substations and run temporary supplies, all by direct labour and at low cost. This wide experience stood the C.E.B. in Scotland in good stead at the Greenock bombing.

At the end of the war the load had grown and expansion was general, necessitating staff increases both manual and supervisory. The section engineers were now given assistants with additional cars and vehicles, some of the latter being fitted with winches for conductor pulling. The winches enabled lines to be dropped and pulled up again much more quickly and safely, and required less manpower than block and tackle methods, even when the final pull was by a vehicle. This was important as at this time all old cone conductor joints were being changed for compression joints.

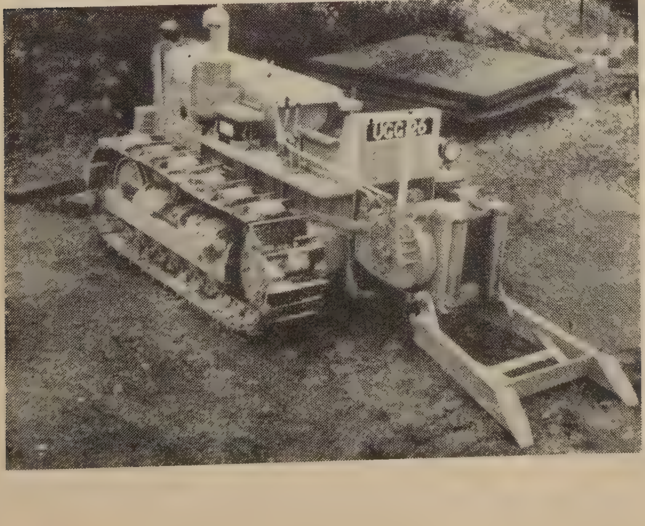

Fig. 1.—David Brown crawler tractor with a Boughton winch

A David Brown crawler tractor with a Boughton winch was acquired a few years later and proved invaluable in the conductor restringing which started in 1948 and has continued steadily since. This tractor could go over soft ground and do less damage than men in rubber boots. On boggy ground, of which we have plenty on Scottish line routes, it could pull itself out by using the Boughton winch should the tractor become bogged. This tool speeded work, by its mobility and because the winch could "pull in" smoothly to the very small fraction of an inch required for releasing or coupling a line under tension. The tractor weighs about four tons and carries spades which hold it in a stationary position when required, thus avoiding the necessity for installing temporary anchors or "dead men." This tractor has also represented a saving in manpower in the form of a small increase in personnel as compared with the large increase in the work to be undertaken.

A recent improvement upon this tractor has been the changing to a larger model with power reverse on the winch, giving equally exact power control in both directions (Fig. 1). By 1952 v.h.f. radio began to be used and enabled many an awkward line job to be speeded up, particularly river crossings. This v.h.f. radio is fitted on the tractor at the operator's side, enabling linesmen on the tower cross-arms to give their exact requirements. This tractor is taken to site at speed on a crawl-on trailer towed by any of the Bedford 4×4 linesmen's vehicles with which each section is provided. With such equipment 75 per cent or more of all restringing has been carried out by direct labour with no increase of staff for this purpose. This has proved the cheaper method for the Board. Further, it has once more provided us with highly trained teams of linesmen well able to tackle any line fault. This step became necessary because the teams were becoming weakened by retirements.

By 1955, when the present Board was formed, manual staffing in sections had risen to about double the 1930 figures, the system having almost trebled. With much original equipment still in service, maintenance and repair had very greatly increased, concrete structure repairs becoming a big problem. In the substations the staff

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* Transmission/Distribution Engineer, South of Scotland Electricity Board.

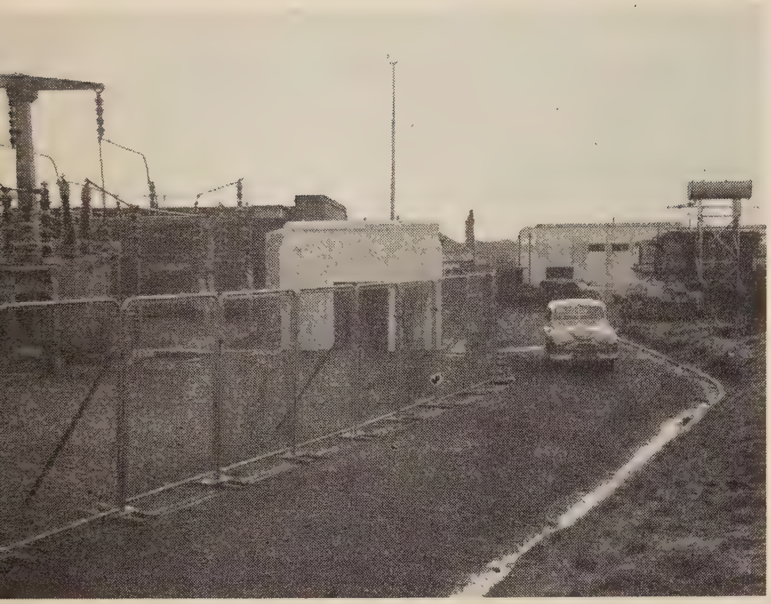


Fig. 2.—Temporary fencing protecting 132 kV compound at the Saltcoats substation

were now engaged on testing old 132 kV bushings and lower-voltage intertank bakelite bushings in transformers. Hundreds of the latter were found to be in very bad condition under Schering bridge test. Reactors were taken off transformers, dismantled, re-insulated, and then re-erected. Older grid transformers with low winding i.r. are now treated by one or other of the high vacuum processes. Old mechanisms, however, remain a problem and repair shop equipment was improved to speed this work.

Testing Equipment

The sections were now provided with modern measuring equipment, including Forrest or English Electric electronic and mains-operated 5 kV Megger insulation testers. The growing loads in substations resulted in an increasing number of busbar connector failures, and it became necessary to test all joints and connectors periodically with Ducters, an enormous task which has necessitated extra staff in all sections. Urgent construction simultaneously in several substations in each section required more men as safety guards. Frequent permits for this construction work also increased the need for engineering staff on each section. This necessity for extra safety guards was minimised by the use of portable metallic fencing specially designed to be quickly erected and dismantled (see Fig. 2). Live open type substations are being fenced off from buildings to permit free entry to premises not containing live h.v. equipment. Thus, safety guards will be needed only when the live substation proper has to be entered by contractors, etc.

New techniques in protection using telephone intertripping were extending in Scotland in the early 1950's. These methods of connection save capital as less switchgear is required. Transformers can be teed to existing circuits and protected through telephone intertripping at all infeeds. The capital saved is very considerable, but there are repercussions on the maintenance and operational side. With the older grid system the isolators at each end of an interconnecting line can be opened and earth switches closed by N.J.I.C. staff. One man at each end operates to the control engineer's instructions; also a permit is taken out at the work site by the engineer on the line, again through the control room. On teed feeders, on the other hand, outages can be very much more difficult to arrange as the line is not only concerned with through load but has an additional duty. The time taken making arrangements and in switching is increased, and owing to safety and technical complications at tee points the presence of an engineer is invariably necessary.

Teed Feeders

Teed feeders are often installed to relieve overloaded distribution, thus outages are usually even more difficult to arrange and are too often restricted to weekends. In Scotland only about half the week-ends in any year are in the season suitable for work on outdoor gear. A weekend of two full-day outages, each from 8 a.m. until dark, with travel, switching and permit issues, taking two extra hours, night and morning, requires two engineers to cover an operation on any teed feeder. On such a feeder outage there would probably be six linesmen on the overhead system, and as terminal equipment must be looked after under cover of the one outage three fitting squads of four men each would also be involved. The total time actually required for spring and autumn insulator cleaning and summer checking and repairing of conductors, insulators, fittings and substation gear would be some 11 days per circuit, or 11 weekends for a double-circuit feeder. Allowing for our Scottish inclement weather causing cancellations, more than half the 32 summer weekends would thus be used up. Half the cost of the two engineers, six linesmen, 12 fitters or mates, drivers and storekeepers who might have to be out could not be less than £11,500, which could be regarded as the cost of maintaining this feeder. In winter it is only possible to do preparatory work. On simple transformer feeders which can be taken out easily at short notice through the week and do not have to be returned for service every night, costs are much lower, since the overtime charges are less and the engineers do not have so much excess time to recoup. A similar d.c. feeder without tee point complications given equal maintenance time would require 14 men and 22 days; even allowing for considerable overtime and normal supervision this would not cost more than £1,600, hence a saving of nearly £10,000 is effected if week-end working is avoided. Many operations like these can be detailed into the programme simply and inexpensively.

However, the teed feeder costs can be cut to a figure between the higher and lower ones quoted if, as postulated, fringe feeders are available which enable work to be carried out continuously through the week. The greater the amount of apparatus connected to one feeder the nearer will the cost be to the higher figure as each extra supply at hazard during an outage must demand speedier work, more overtime and excess hours. Like all peak loads this is extremely expensive. Increasing numbers of such teed feeders thus require a very large staff increase indeed if the maintenance work is still to be done. The same general principle applies to underground grid feeders, but maintenance on cables is very small, so work on such feeders is more or less confined to the transformers and switchgear.

Weed control in the immense area of modern substations has been tackled in Scotland by putting weed killing out to contract. Costs have been no higher than previous "weeding" methods. This practice has now spread to distribution substations in South Scotland with equally satisfactory results. Our own staff can thus attend to more urgent duties.

Regular line patrol work at summer peaks has been carried out by helicopter to leave men available for restringing, both directly or controlling contractors' operations. Special extra lightweight bosuns' chairs were developed for the speedy fault-locating patrol of twin conductor 275 kV lines (Fig. 3). Metro-Cutanit contacts were fitted to most old transformer tap changers and were a success in reducing the number of maintenance outages to less than half the previous figure. For the rapid determination of the cause of Buchholz relay operation in the field "explosimeters" have been introduced to cut down delay. They give an immediate indication of the state of a gas sample inflammability or otherwise.

The use of v.h.f. radio is rapidly being extended to give almost complete coverage of all transmission sections and vehicles, including private cars, and the helicopter when on patrol has already proved an invaluable time saver in each section so equipped.

Burglary in substations has been on a greater scale in the last few years until infra-red or door contact burglar alarms were fitted to the substations most affected, and break-in ceased at each point so equipped.

Standardisation

As mentioned earlier, standardisation of equipment in the early grid system was emphasised. On nationalisation, however, the small transmission teams merged with larger generation bodies and the resulting methods of purchasing tended to depart from the standardisation policy. As a result, we have had to increase staff as individual fitters can be trained to deal with only a certain variety of equipment. By doubling equipment of the same make it can be maintained with a small increase in staff, say 30 per cent. Doubling the equipment, but with diverse makes, will require more than double the maintenance manpower. Additional staff may also be needed to cover specifying, ordering, stocking and inspecting the extra stores and spares. In complicated substations and with teed feeders, where only limited weekend outage times can be obtained, 50 per cent more men must be called out than for a mid-week job. The constant training of growing staffs, technical and manual, is a severe burden on the relatively small teams of engineers engaged on transmission work. With these extra burdens it is difficult, with the restricted outages caused by increasing load and less flexible circuit arrangements, to ensure anything like the quality of preventive maintenance to which the grid in the past has owed much of its reliability and on which the present design data are based.

Many who do not know the work think of grid maintenance as a simple and easy job. Nothing could be further from the truth. Manufacturers' staffs carrying out erection of their gear must do so in a reasonably unrushed way to achieve competitive costs. Maintenance staffs, on the other hand, have usually to return gear to service in the absolute minimum time. This means doing similar work more than four times faster than normal contract work. Transmission overtime is thus about the highest in the industry, but it is justifiable in face of the risk of failure of a fully loaded feeder during the work. Also, the cost of running "out of order of merit" plant can be as high as £100 per hour in Scotland. An additional maintenance problem is the use of suitable cranes in grid substations to give adequate speed with requisite mechanical and electrical safety.

In 1947 purchasing and accountancy ideas changed radically. Previously, contractors' services and material were ordered directly by an experienced engineer. With the new purchasing system everything has to be specified and three or more prices obtained. Preparation of specifications was work many maintenance engineers had not previously undertaken. To do this for repair work, where the full extent of the work required may not be known at the outset, can be extremely difficult. With the engineers already fully occupied, much work, not in the first degree of urgency, had to be dropped, and specialist tradesmen had to be engaged, namely, painters and building tradesmen, particularly for substation work. As already stated, some breakdown in standardisation of grid equipment resulted in increased work and costs, and following investigations into this problem the position shows signs of improvement.

Longer holidays for all are now the rule. While this is appreciated by the staff, it has been a big factor in the necessity for additional personnel. Major transmission work has to be undertaken in the summer months and this embraces the holiday period. While National Joint Advisory and other committees set up under nationalisation are valuable in a team which has small numbers in relation to the amount and tight programming of work to be done, the withdrawal of staff for such committee work is often felt severely in the South of Scotland.

In the past co-ordination of outages and work was very complete but here again the effects of nationalisation tended to break down co-ordination. Work may be given to several small contractors on a price basis rather than to one large contractor. These contractors may require

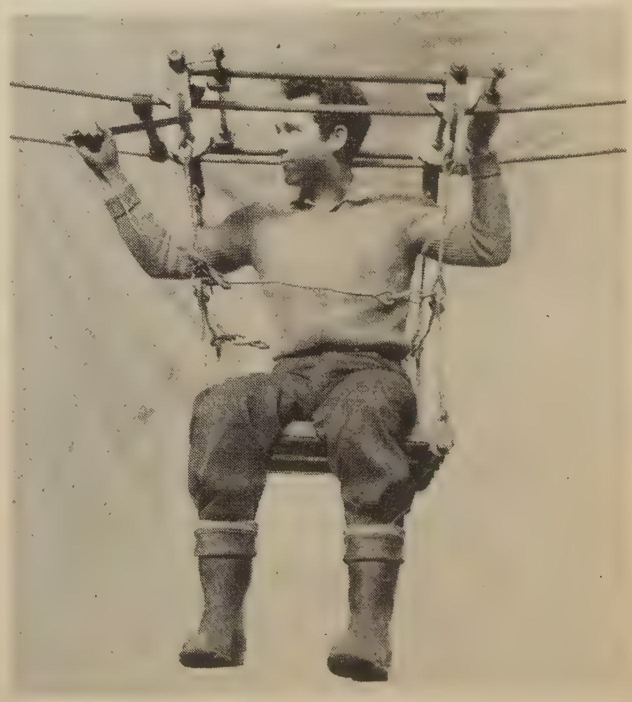


Fig. 3.—Lightweight bosun's chair for patrolling 275 kV lines

to open several substations, thus keeping a Board employee all day at each. Small contractors often do not have foremen or chargehands for each site which increases our work and the number of men engaged in site supervision. At the moment there are more men on this work than the total original grid staff. After commissioning, should a fault develop, manual staff cannot identify parts where these are non-standard and an engineer is needed to visit the site. As these facts become apparent they are pointed out and we hope to get back to more standardised equipment in future. Infra-red-beam equipment is being investigated to see if this can help to detect personnel passing out of safe zones. We hope to get a reduction in the numbers of staff on safety guard duty in large substations in this way.

Co-ordination

Outages are again being co-ordinated so that each outage is used for construction, maintenance, repair, and protection test purposes so far as is humanly possible.

Unless the section staff on maintenance in the field are given adequate access to the equipment, manpower and tools they need, vital work will be prevented with the possibility of serious supply interruptions resulting. The transmission section has, after all, to sort out the troubles, make the gear work, and keep it working. The more this work is understood and assisted the cheaper it will be, but it is easy in big organisations for other departments which are well-intentioned but do not understand the work to overload transmission staff with additional work to the detriment of essential duties.

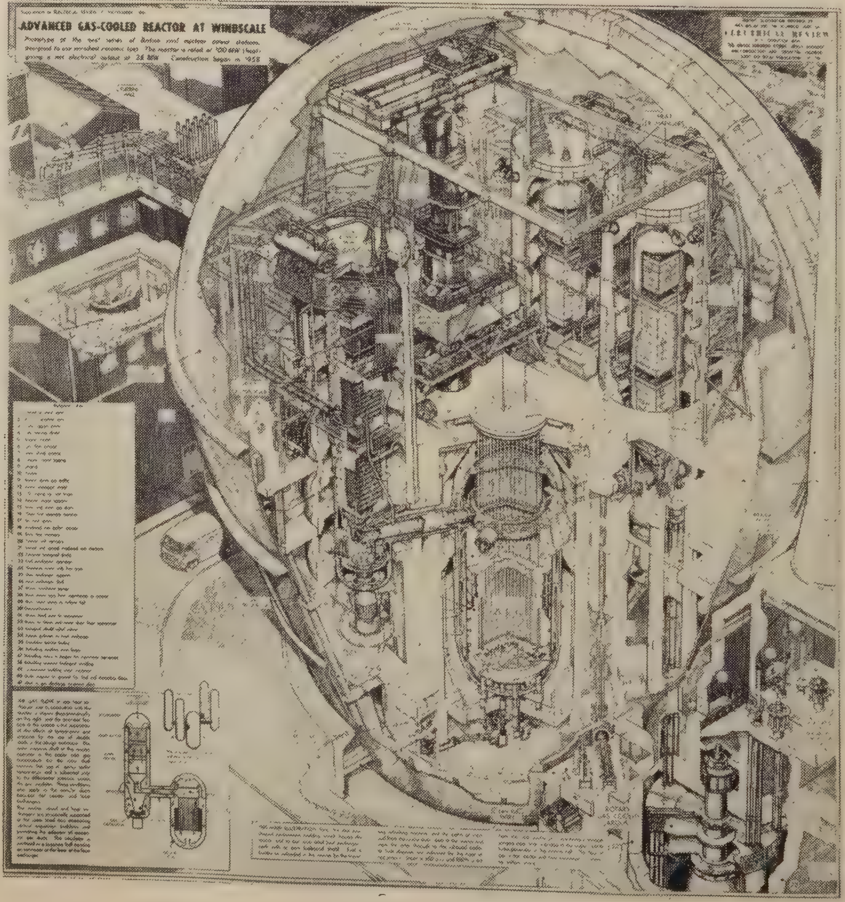
At headquarters the recording of maintenance progress is done on a chart. The markers are of coloured adhesive tape which can be removed when the board has to be changed. Once a year the year's work is photographed to form a permanent record. This cuts out written work at headquarters and in the sections, and has eliminated monthly, quarterly and half-yearly reporting.

The changes in organisation of the supply industry have meant more than full-time work for all transmission headquarters staff and it is their eagerness which has enabled the work to be expanded and costs kept to the minimum. The term " transmission " applied to the 132 kV grid has been used in this article but it is already clear that in the future this voltage network will tend to become " distribution."

The foregoing remarks on the reduction of costs of maintenance of high-voltage electrical equipment remain valid, however, as the methods used for operation and maintenance are dictated by considerations of safety and security of supply. These methods depend on such factors as the kilovoltage of the system, the size and weight of the components and the importance of the supplies dealt with.

Nuclear Power in Britain

A SPECIAL issue of the *Electrical Review* containing a comprehensive survey of the use of nuclear power for electricity generation in this country will be published on 17th November. It will include articles on the present and future pattern of nuclear power in the United Kingdom, some aspects of the nuclear power programme, and the design concept of the advanced gas-cooled reactor (A.G.R.). A special feature will be a full description of the prototype A.G.R. now nearing completion at Windscale with a 30in by 40in multi-coloured drawing, prepared by Max Millar and illustrated here. This shows in detail the reactor, its four associated heat exchangers, and the refuelling machine, and indicates the paths of fresh fuel from the preparation room to the reactor and the flow of gas in the reactor and heat exchangers. Steam at 650 p.s.i. and 850°F is taken from the heat exchange superheaters to a 33 MW turbo-generator.



Reproduction of a photograph of the large coloured drawing of the Windscale advanced gas-cooled reactor which will appear in the " Electrical Review " of 17th November

Vacuum Melting Alloys for the Electrical Industry

By **R. V. MAJOR**, B.Sc., Grad.Inst.P.,
G. G. GLEN and **P. M. GRAY**, B.Eng.(Met.)*

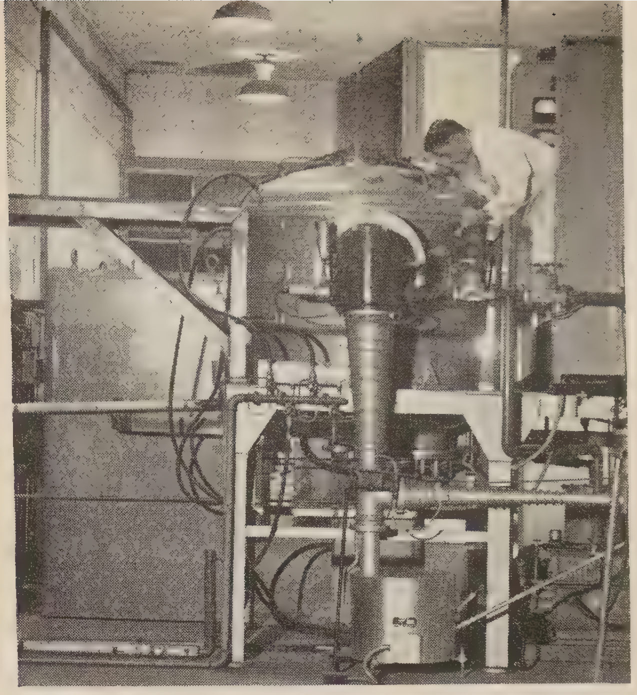


Fig. 1.—56 lb capacity vacuum melting furnace

Many advantages are offered by vacuum induction melting over air melting. A higher quality material is produced since dissolved gases are reduced to low level, oxidation of the charge is prevented and precise composition can be attained with a marked reduction of non-metallic inclusions. It is also possible to melt or make additions of reactive elements not normally possible with conventional air melting. Vacuum melting has resulted in significant improvements in electrical and magnetic characteristics, wear resistance, high-temperature strength, ductility, hot workability and fatigue resistance

COMMERCIAL-SCALE vacuum melting was first carried out by Heraeus Vacuumschmelze A.G. around 1920 using resistance heating and working at pressures very much higher than those obtained today. In the early 1930's high-frequency induction heating was employed in vacuum melting furnaces and before the second world war the Telegraph Construction & Maintenance Co., Ltd. (now Telcon Metals, Ltd.), was vacuum melting and vacuum casting on a commercial basis. The type of furnace employed consisted of a high-frequency furnace body mounted inside the vacuum chamber with a mould held at right-angles to the crucible. The furnace was evacuated by high-capacity mechanical rotary pumps and the alloys were melted and cast at pressures as low as 10^{-1} mm Hg. The 800 V, 500 c/s supply was derived from a motor-generator rated at 150 kVA. During the last 15 years many advances have been made in vacuum engineering resulting in improved pumps, higher pumping speeds, improved static and rotating seals and improved vacuum gauges.

Vacuum induction furnaces incorporating these developments and ranging in size from 56 lb capacity (Fig. 1) to 750 lb capacity (Fig. 2) have been installed by Telcon Metals, Ltd. A 56 lb capacity vacuum furnace is used for research, pilot production of ingots and precision casting. The furnace consists of a 4ft diameter water-cooled tank containing a tilting induction coil assembly, a rotating mould table, two addition hoppers, and two immersion pyrometers. The lid of the vacuum tank, which incorporates an observation port and a poker, rests on a Neoprene ring seal. The cooling water for the induction coil and the power supply leads enter the tank through a coaxial seal. A 50 kVA vertical motor-generator provides a power supply of 400 V at 5,000 c/s for the melting operation. This furnace operates at pressures down to 10^{-4} mm Hg which is obtained by an air ballasted rotary pump and a vapour booster pump. The vacuum is measured by continuously-reading gauges.

Production Vacuum Furnaces

The bulk of the company's vacuum melted materials is produced by 750 lb furnaces. There are two identical furnaces and one generator, so that the power can be supplied to each furnace in turn. This permits one furnace to be recharged and evacuated while the other is carrying out the melting cycle.

Each furnace consists of a conventional high-frequency melting coil assembly mounted in a vertical water-cooled tank, 6ft 6in in diameter and 10ft 6in deep. Power from the 400 V, 200 kVA, 1,000 c/s generator is fed to the coil through a coaxial seal which also incorporates the hydraulic crucible tilting mechanism. Extreme care has to be taken with insulation to prevent electrical discharges within the chamber. The coil, insulated with polyester resin, is mounted in a stainless steel frame. Great care has to be taken in the design of this frame to keep the induced voltage to the minimum. There is some doubt as to the most suitable coil supply voltage, but 400 V appears to be the most popular, although voltages up to 800 V have been used in the past. Since only about half of the raw materials to be melted can be charged into the crucible at the start of the process, the balance of the

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* Telcon Metals, Ltd. Since the article was written Mr. Glen has left the company and is now at the Gas Council's London Research Station.

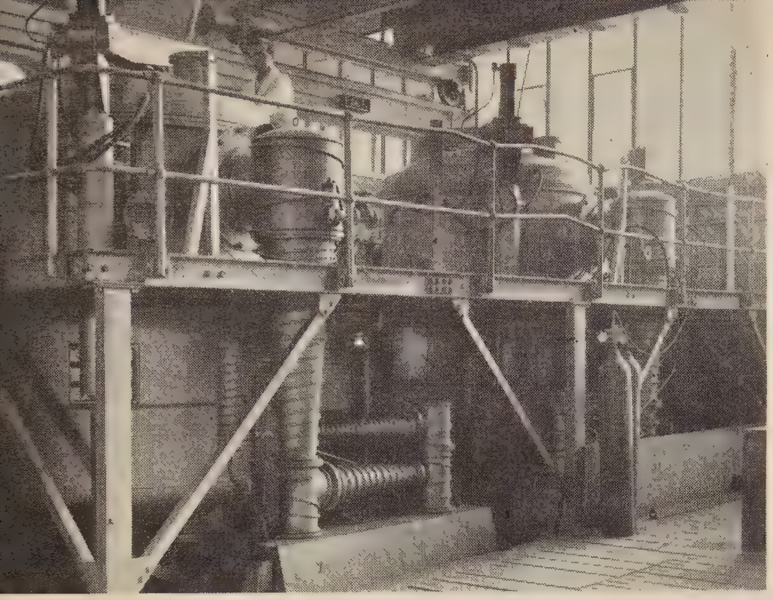


Fig. 2.—750 lb capacity vacuum melting furnace

charge has to be stored in a chute and a series of boxes mounted around the periphery of the tank. The material is transferred from the boxes to the crucible via the chute by remote control without breaking the vacuum. The 6in square ingot moulds into which the alloys are cast stand on a 6ft diameter table in the bottom of the tank. The equipment also includes two internally mounted pyrometers, a poker, two observation windows and continuously-reading gauges similar to those used on the 56 lb furnace. A mechanical rotary pump and vapour booster pump constitute the pumping equipment for each furnace.

Once the preparation of the furnace is complete, the chamber is evacuated to a pressure of between 1 and 10 microns at which melting is carried out. The charge is held for a period to allow the removal of gases dissolved in the molten metal. When the degassing process is complete, the final alloying element additions are made and the alloy is poured into the moulds via a tundish.

Melting Practice

As already mentioned, vacuum melting permits controlled reductions in gas contents, precise composition to be obtained and the removal of some elements which may have an adverse effect on magnetic and mechanical properties. During the melting-down and holding period, diatomic gases such as hydrogen and nitrogen are reduced to a level which is proportional to the square root of the partial pressure of the gas if equilibrium is attained; the latter is assisted if good induction stirring is obtained in the bath. The rate of gas removal is controlled by the circulation of the metal and the diffusion rates of the gases; consequently a holding period of the molten bath is necessary to achieve low gas contents.

Oxygen may be present in the form of a metallic oxide in the material charged. The vapour pressures of most commonly encountered oxides are too low for dissociation yet their continued presence may result in blown ingots, blistered and laminated strip and inferior properties of the alloy. The normal practice to overcome this is to add controlled amounts of manganese and possibly silicon as primary deoxidants where their function is to form stable oxides of low solubility of the melt. This oxide may float to the surface of the bath or remain in the metal in a dispersed form where it has a much less marked effect than the original metal oxide. The amount of a deoxidant such as manganese which is added is the minimum consistent with achieving effective deoxidation in an alloy of the soft magnetic type.

Carbon may be used in special circumstances and has the advantage that the deoxidation product of carbon monoxide is continuously removed by the vacuum pumps and absolutely "clean" metal is obtained. Carbon deoxidation introduces the danger of carbon pick-up by the alloy and the tendency for violent boiling to occur in the molten bath, but various procedures have been developed to avoid these disadvantages.

Before teeming the molten alloy, final additions of elements such as magnesium, cerium and calcium may be added to reduce the sulphur content of the alloy. Sulphur not only has a detrimental effect on the magnetic properties of an alloy but causes hot working difficulties due to the formation of low melting point sulphides at

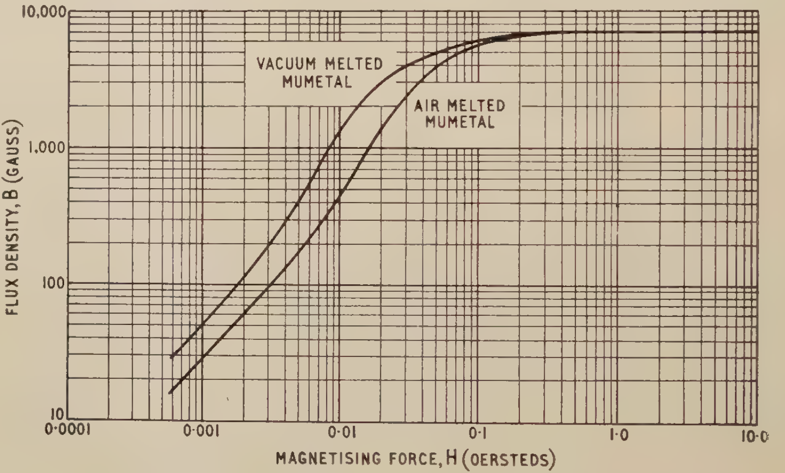


Fig. 3.—Normal induction curves for vacuum melted and air melted Mumetal

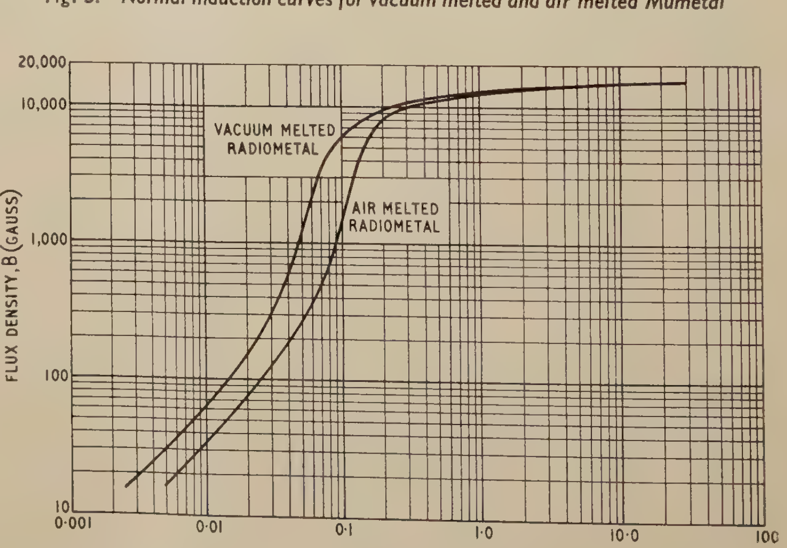


Fig. 4.—Normal induction curves for vacuum melted and air melted Radiometal; d.c. measurements on rings stamped from 0·015in strip

grain boundaries. It can be seen from free energy data that most metal sulphides, such as those of nickel and iron, cannot be dissociated in the temperature and pressure range commonly encountered in vacuum induction melting. However, by adding elements such as cerium or calcium on completion of deoxidation, very stable sulphides are formed in preference to those of iron and nickel. The effectiveness of some of these additions is assisted by making them under the partial pressure of an inert gas.

Properties of Vacuum Melted Materials

Permeability, coercivity and losses are the properties of a magnetic material most sensitive to small changes in structure whereas properties such as saturation magnetisation and curie point are not structure sensitive. These structure-sensitive properties can be used as parameters to assess the effects of vacuum melting. The manner in which these changes in magnetic characteristics are effected is best understood by consideration of the major cause of internal strains, namely, the presence of impurities. These can be interstitial elements such as hydrogen, nitrogen, carbon and sulphur which squeeze themselves between the planes of atoms, causing severe local straining of the lattice. The substitional type of impurity causes distortion of the lattice by replacing parent atoms. Silicon and manganese are typical of this type of impurity. The level of interstitial and substitional impurities is greatly reduced by vacuum melting and the manner of this reduction has been described previously.

The improvement in magnetic properties obtained by vacuum melting of some of the common soft magnetic materials used in industry will now be described. Mumetal, for example, is a high-permeability, low-loss alloy containing 77 per cent nickel and it is extensively used in transformers, relays, moving-iron voltmeters and ammeters, and for magnetic screening. Typical normal induction curves for vacuum and air melted Mumetal are given in Fig. 3 and the improved permeability brought about by vacuum melting is easily seen.

Radiometal is a 50 per cent nickel-iron alloy with high initial permeability, high saturation and low electrical losses. It has applications in transformers and chokes where the operating flux density is higher than is possible with Mumetal and also where the low permeability of silicon iron is inadequate. The comparison of air and vacuum melted material, which is shown in Fig. 4, again illustrates the improved permeability for vacuum melted material.

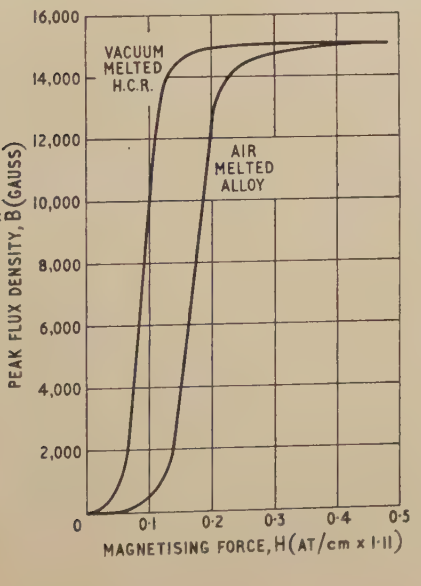


Fig. 5.—Magnetisation curve for vacuum melted H.C.R. compared with an air melted alloy of similar composition; 50 c/s measurements on toroidal cores wound from 0·004in tape

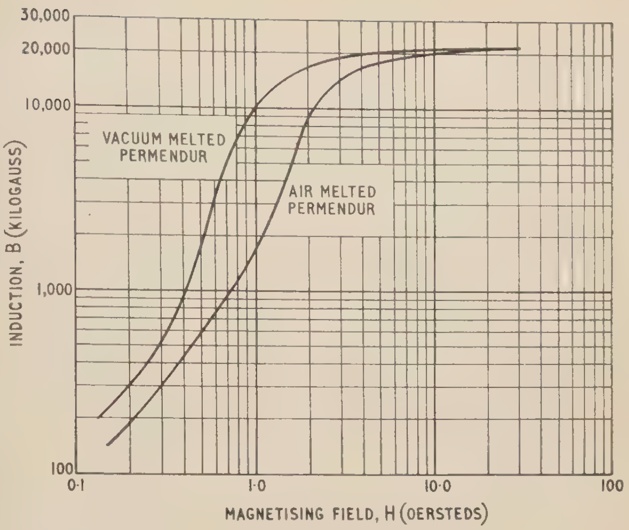


Fig. 6.—Normal induction curves for vacuum melted and air melted Permendur; d.c. measurements on rings stamped from 0·030in strip

H.C.R. alloy is a grain-oriented 50 per cent nickel-iron alloy with a markedly rectangular hysteresis loop. It is widely employed for the cores of magnetic amplifiers and for this application it is essential that a high degree of consistency in magnetic characteristics should be maintained from batch to batch. This consistency has been achieved by vacuum melting and the improved characteristics obtained are shown in Fig. 5.

An iron-cobalt-vanadium alloy known as Permendur has the highest saturation induction of all commercially available alloys and is extensively employed in high power/weight motors and generators for aircraft where space is of paramount importance. Fig. 6 shows the considerable improvement in permeability achieved with the vacuum alloy compared with the air melted material. The improved mechanical properties also obtained are particularly important with this alloy.

Vacuum melted alloys are found to be far more responsive to special processing than air melted materials. Under research conditions the following exceptional characteristics have been achieved:—

Supermumetal	Initial Permeability Maximum Permeability	200,000 500,000
Super Radiometal	Initial Permeability Maximum Permeability	17,000 100,000
Supermendur	Maximum Permeability	100,000

One of the main characteristics of vacuum melted alloys are their consistent properties. This is of considerable importance to the engineer who must design to the minimum magnetic characteristics developed by materials supplied by the manufacturers.

In addition to magnetic alloys there are many examples of materials used by the electrical industry, whose properties are substantially improved by vacuum melting. Vacuum melted copper is practically free from volatile impurities and is superior to o.f.h.c. copper. It is employed in thermionic valves and similar devices where any volatile impurities will affect their characteristics. Another application of this material is in copper oxide rectifiers where again the characteristics are very dependent on composition.

Alloys for glass-to-metal sealing again benefit from vacuum melting. Since these alloys are free from non-metallic and other impurities, they can be used without a prior degassing treatment which is essential for air melted materials. Equally important is the fact that vacuum melting enables precise control of the chemical composition to be maintained and consequently equally rigid control of the expansion characteristics of these alloys.

The low inclusion content of vacuum melted alloys is a great advantage in the manufacture of fine gauge resistance wires. The effect of inclusions on the mechanical and resistance properties of the wire becomes increasingly important as the fine gauges are reached.

Conclusion

It is obvious that properties, hitherto unobtainable, can now be reached as a result of advances in vacuum furnace technology and special processing techniques. Not only are remarkable improvements being obtained with well-established alloys but new alloys, which could not be produced by air melting, are being developed.

Vacuum induction melting is a more expensive operation than air melting due to the higher cost of the plant and the need for highly trained personnel to operate and maintain it. These costs may be offset by precise control of structure resulting in the ease of meeting electrical, magnetic and mechanical specifications. As the advantages of vacuum melted alloys become increasingly apparent the demand for them continues to rise rapidly.

Acknowledgment is due to Telcon Metals, Ltd., for permission to publish this article.

COMPUTERS AND REACTORS

A PAPER on "The Use of Analogue Computers in Predicting the Space-Time Behaviour of Nuclear Reactors," by Messrs. R. W. Hockney, M.A., and T. O. Jeffries, M.A., D.Phil., A.Inst.P., was read at a meeting of the Measurement and Control Section of the Institution of Electrical Engineers on 24th October.

The authors said that the dynamic behaviour of a complex system such as a nuclear reactor could conveniently be studied in an analogue computer. The simulation of a reactor might be performed in a number of different ways, according to the problem which was being studied. For instance, the study might be concerned with small perturbations from the steady state, information on which was required over the entire reactor. In this instance, a simulation might be required which neglected many of the non-linearities but took into account the spatial variable in fair detail. On the other hand, there might be occasions when the space variation was not of primary importance, but perturbations of a large order of magnitude were necessary, and in this all the non-linearities must be included. Ideally, one would like to include all the space variables and all the non-linearities in one simulation. This, unfortunately, made the problem prohibitively large.

In general, there were two methods by which the simulation of a reactor might be achieved. The equation which described the behaviour of the neutron flux was a non-linear wave equation coupled to the heat transfer of the system. The spatial dependence of the flux in the wave equation might be represented by finite differences, giving a multi-point approximation. Alternatively, the wave equation might be solved in terms of a set of orthogonal harmonics, and this method was generally known as the modal approach.

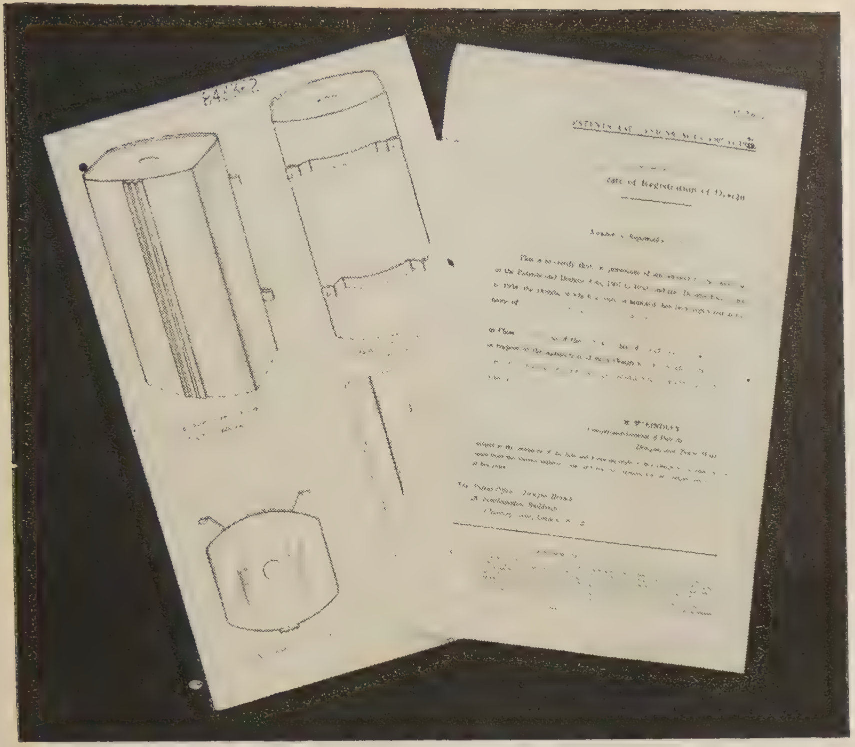
In the finite-difference method, the inherent approximations when representing a continuous function at discrete points limited the accuracy, particularly if a high harmonic content was present in the spatial waveform. However, it was feasible to use very little linearisation in these equations, and hence the method was valid for large changes from the steady state. In the modal approach, on the other hand, a certain amount of linearisation was almost inevitable if the number of cross-coupling terms between the harmonics was to be kept within reason. This method was therefore of most use in considering small perturbations from a steady state.

The equations to be solved in the case of the current magnox power stations were described in the paper and three approximations suitable in different circumstances were given. The application of one of these methods to an investigation of spatial instabilities was presented.

Faraday House Dinner

The annual dinner of the Old Students' Association of Faraday House Electrical Engineering College was held last Friday at Quaglino's in London, under the chairmanship of Mr. G. S. Buckingham, President of the Association. The toast to the College was proposed by Mr. G. S. C. Lucas, President of the Institution of Electrical Engineers, who spoke of the value of experiment and observation in developing an inquiring mind. He wondered whether the modern trend in electrical education developed such a mind or whether it gave too little appreciation of craftsmanship. In engineering it was important to use the right materials in the correct manner. Knowledge of materials was best obtained by handling them, particularly if they had been recently introduced, and he regretted a tendency by engineering students to avoid contact with such materials. In his reply Mr. F. A. Bell, deputy chairman of the College's board of governors, referred to some developments at the College during last year, which included modernising the older part of the premises and the provision of new laboratories, canteen and teaching equipment.

The toast to the guests was proposed by the chairman whose speech humorously describing his days as a student was very well received. The reply was made by Sir Dennis Proctor, Secretary to the Ministry of Power.



DESIGN REGISTRATION

Certain features of the appearance of a product other than those arising from the type of construction used or are necessitated by the product's subsequent function can be registered at the Patent Office. The procedure and requirements for this are described in the article. Comparable information on patents and trade marks has been published in the issues of the *Electrical Review* dated 23rd December, 1960, and 22nd September, 1961

By S. AUSTEN STIGANT,
M.I.E.E., Fellow A.I.E.E.

OUTSIDE professional patent agent circles it is not always appreciated just what is meant by "designs" in the context of the Registered Designs Act. According to the 1949 Act, Section 1 (3), ". . . the expression 'design' means features of shape, configuration, pattern or ornament applied to an article by any industrial process or means, being features which in the finished article appeal to and are judged solely by the eye, but does not include a method or principle of construction or features of shape or configuration which are dictated solely by the function which the article to be made in that shape or configuration has to perform."

Thus, a "design" is not a kind of petty patent which will give protection to, for example, what an engineer commonly calls the design of a machine when that machine has insufficient novelty to support a patent. Moreover, to obtain registration, a design must be "new or original" at the date of application. Where the application is made with a claim to convention priority (relating to foreign registration application) the design must have been "new" at the date of the application in the convention country of origin. Section 6 of the 1949 Act provides for certain exceptions to this ruling, however; in particular for designs previously shown at an approved exhibition or communicated to a Government Department. Section 4 of the Act makes provision for allowing the proprietor of a design to register the same design in respect of further articles, or minor modifications of the same design, where the ordinary novelty rule would bar such registration.

Applicants

An application for registration can be made only by the "proprietor" of the design, this term being defined in Section 2 of the 1949 Act. The original proprietor is either the actual author, if he is working on his own account, or the author's employer. If the original proprietor assigns the design before applying to register it, the assignee can apply. The proprietor may be one or more individuals in conjunction, a firm or partnership, or a corporate body. In the case of an individual proprietor the full name and address of the applicant must be stated; for firms or partnerships the full names of all the partners and the business address should be given and the application signed by a partner on behalf of the firm; for corporate bodies the application form should be signed by a director, secretary or other authorised official of the company, and the company's address should be given.

In the case of an application dealt with by an agent, the agent must be authorised (on an official form) by the owners and the authority should be signed and otherwise dealt with as in a form of application.

Prior Publication

Generally, prior publication prevents a design from being registered. If, however, the date claimed for priority is earlier than that of publication, an application for registration will be entertained.

Documents to be Filed

An application for registration of a design is made on an official form obtainable from the registrar and, for a single article, must be accompanied by three identical representations of the design. The application must also be accompanied by a separate statement of the novel features claimed for the design, i.e. whether the novelty lies in the shape of the articles as a whole, or in the shape of some specified part, or in the pattern or ornament applied to the article. The applicant should consult Section 9, Representations, of the official pamphlet "Instructions to Persons Who Wish to Register Designs" (obtainable free from the Patent Office) for information on drawings and photographs. If in doubt as to exactly what is necessary, he can, in the first instance, file such as are readily available, or can easily be prepared, leaving the formal copies to be made upon hearing from the Designs Registry. With designs there is no classification of goods as there is for trade marks.

Application Procedure

An examiner institutes an official search to ensure that the design is basically acceptable and that the same or a similar design has not previously been registered or otherwise published. If the examiner finds any prior publication which he considers anticipates the design being considered, he notifies the applicant. An official report on an application is usually issued within six weeks. If the Designs Registry intends to object to the merits of the application, either on the ground of lack of novelty or of unsuitable subject matter, this objection is ordinarily raised first. If there is such an objection, the applicant is entitled to an oral hearing at the Registry, where a senior officer decides whether or not the examiner's objection is justified. If there is no objection to the merits, or if the hearing officer has decided in favour of the applicant, objections may be raised to the form of the papers, particularly of the representations. Once the papers are in order, a certificate of registration is issued without further formalities or fees.

Upon registration the Registrar lists the design in the *Official Journal* (*Patents*) and it is then open to public inspection. There is no provision for public inspection prior to registration for the purpose of possible opposition.

If the applicant complies promptly with official requirements, registration can be obtained within a few months, at the most. The application will be treated as abandoned if the applicant does not put the papers in order within 12 months of application, this period being extended by another three months on payment of a fee (Section 3 (4) and Rule 33).

Marking of Protected Articles

Articles protected by registered design should be marked "Registered," or some abbreviation of this word, and with the official number of the registration. Failure to mark in this way may prevent the recovery of damages from infringers. However, a design may be referred to as "Registered" only after it has been entered on the official register and a certificate of registration issued by the Registrar. Prior thereto an applicant may use words such as "Registration applied for."

Life of Design and Convention Priority

In Great Britain a design registration remains in force for five years from the date of registration, which is usually the date of the original application for registration. It may be renewed at the end of that period for two further periods, each of five years' duration.

This relates to foreign applications (based on a country-of-origin application) filed in any country that is a party to the International Convention for the Protection of Industrial Property, under the terms of which protection abroad with full priority can be obtained provided the application is filed in the foreign country within six months from the date of the first application in the country of origin. No extension of time beyond the allotted six months is permitted in respect of such foreign applications if the priority date is to be maintained. Foreign applications filed after the six months referred to lose the convention priority date but are not otherwise affected.

Filing Abroad

A British design registration automatically gives equivalent protection in numerous colonies (e.g. Hong Kong). Protection in the Dominions and foreign countries involves a separate application in each country. It is impossible to generalise about these in the case of designs, as the difficulties of obtaining registration, costs involved, duration of protection, etc., vary even more widely than in the cases of patents and trade marks. In most countries an application will be invalid if not made either within the convention priority period or before the design is publicly used or otherwise published, so that advice about protection abroad should be sought at an early stage.

Searches

As a rule a patent agent makes a search only to establish the existence of prior registrations when so requested by the applicant; he is not expected to do this simply as a matter of course when an application is filed. As already indicated, the Registrar makes a search as part of his duties when he comes to examine the application.

Definitions of Relevant Dates

Date of Registration. The date "as of" which the design is registered. It is normally the date of application, but where the British application is filed with a priority claim, it is the priority date.

Date of Issue. The date upon which registration of the design is entered on the official register and a formal certificate of registration issued. Damages for infringement run only from this date.

Priority Date. The date of filing the first application in a convention country. If the British application is the first filed, it establishes a priority date which can be claimed for applications filed abroad within six months. Conversely, a British application filed within six months after a first application abroad can claim the priority date of that application.

Convention Date. The convention priority date for foreign applications is the date of the first filing of the application in Great Britain.

Life of Design. Five years from the date of registration and thereafter it may be renewed for two further five-yearly periods.

It is to be noted that acceptance date and publication date have no significance in designs registration and therefore do not appear in the above list of dates. Also, there is no opposition period prior to the date of granting.

Assignment

The assignment of a registered design by the owner to another party must be registered and entered upon the official register. Unless this be done the assignee

[*Continued on page 705*

GENERATION AND TRANSMISSION IN FRANCE

A Comparison with the British System

IN a lecture given in London on 26th October at an ordinary meeting of the Institution of Electrical Engineers, M. P. M. J. Ailleret compared generation and transmission problems in Great Britain and France. M. Ailleret, who is Deputy Director General of Electricité de France, said that the rate of increase in the development of electricity was about the same, with exponential curves divided by displacement in time. At present the shift was six years, which meant that France would reach the present British level in 1967.

The size of generating units was growing in both countries. For about ten years only 125 MW units had been ordered in France. Three years ago a move was made to 250 MW, and very few 125 MW units would be ordered. In France 500 MW units were at the moment only at the study stage.

The difference between the two countries would be fairly small if there were no hydro-electric resources in the South of France. The surface area of Northern France was about the same as that of England and Wales, but in that area the population of France was only 44 per cent of that of England and Wales. The total consumption of electricity was only 29 per cent of that in England and Wales. The proportion of domestic load was much smaller in France, and the decrease in load during the first part of August was of shorter duration but much more marked in France than in Britain. The peak in England was in the evening whereas in Northern France it was in the morning.

Since the beginning of the century, France had turned to hydro sources for about half of its generation, but this percentage of hydro electricity would decline. It was estimated that the total amount of hydro power which could be installed economically corresponded to an annual production of 80×10^9 kWh, about double the expected hydro generation in 1961. A decision had been taken not to increase the rate of installation of hydro plant, but to maintain the construction each year of new hydro stations totalling about $1{\cdot}8 \times 10^9$ kWh generating capacity. In 1970 the production of power from hydro sources would be one-third instead of one-half of the total generation.

M. Ailleret went on to say that one difference between the countries was in the development of the transmission system. French voltages at transmission level were from 63 kV except in the north-west where 90 kV was used, this variation largely being caused by railway electrification schemes. Many 150 kV lines were being converted to 250 kV operation, but most of the system was at 225 kV. At this point M. Ailleret showed some slides illustrating the work of converting single-circuit 220 kV lines to double-circuit 380 kV working.

Greater French Capacity

The French network, he said, had a much greater capacity than that of the British system, although the peak load was very little more than half that in Britain, because there was a larger surface area in France with smaller density of consumption. The development of transmission between hydro and steam regions was a particular reason for enlarging the French system. Electric heating was handicapped in France because in the very severe winters the hydro power resources were severely reduced. Daily pump storage could not be considered as economical. France expected to achieve the development of peak power chiefly by installing hydro power in reservoirs and by the development of gas turbines. The existence of large hydro reservoirs favoured the use of tidal energy which had the advantage of being constant every fortnight, although it was variable within the fortnight. The Rance tidal station would have 24 units of 10 MW each. No similar station was envisaged for the future, and it was difficult to estimate what the cost of energy would be.

Referring to the future of atomic energy, M. Ailleret said that the two countries had started on the same type of reactors. The philosophy behind the building of these stations was different for several reasons, one of which concerned primary energy. France was more dependent than the United Kingdom on the import of primary energy, at present about 35 per cent of the total, and it had led to the institution of an important atomic energy programme. France had built reactors with the aim of getting experience and preparing for the future, but not with the idea of producing energy quickly without importing oil or coal.

In 1962, the reactor known as A.D.F. 1 would be commissioned at Chinon on the River Loire, supplying one

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Design Registration (continued)

may find that legally he is not the owner of the design. Application for transfer of the registrations should be made within six months from the date of acquisition of the design; if later than this, the transfer fees become higher.

Valuable advice on procedure is contained in the official pamphlet "Instructions to Persons Who Wish to Register Designs," already mentioned. The pamphlet includes a list of the official designs forms to be used for specified purposes and of the fees required.

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* Obtainable from the Patent Office.

60 MW outdoor turbo-generator. The construction had been delayed by about one year by difficulties in welding the steam pressure vessel. Next would be A.D.F. 2 which would have two turbo-generators of 250 MW each, and work had been started on A.D.F. 3 with a pre-stressed concrete pressure vessel. At the first stage electric power was fixed at 375 MW, but it was hoped that later two 250 MW turbo-generators would be fed at full power.

The two countries also differed in that France had, for a long time, power interchanges with all adjoining countries. Such interchanges had played only a small part in the economy of each country concerned as the total had only amounted to 2 per cent of the total capacity, ±1 per cent depending on the effect of rainfall on the hydro resources. They had not cost much as it was a simple matter to join neighbouring systems, and the investment was well justified. The interconnection between France and Britain was much more expensive due to the difficulty of crossing the Channel, but the diversity in production and consumption justified a link of 160 MW. Operating experience was required to ascertain whether a stronger link would be justified or not.

Discussion

Although there is not normally any discussion after a lecture, M. Ailleret kindly agreed to answer any questions that members wished to ask. In reply to Mr. T. Rich, he said that natural gas now amounted to 6 or 7 per cent of France's primary energy. Because industry could not immediately use the gas, it was consumed in steam stations. It was a pity, however, to use such a good fuel as gas in a power station and it was being turned back to the Gas Board and then to industry as soon as possible. At present a little gas was being used in the Paris stations, but after next year, natural gas would be used in only one station. Liquid fuel had been found in France in small quantities only, and it had no impact on the electrical industry.

Mr. G. R. F. Nuttall asked about earth wires on transmission lines, to which M. Ailleret replied that the present policy was to have towers ready to take earth wires, but to install them only at about one or two miles from the substations. Lines were now being operated with high-speed closing, and generally it did not pay to install earth wires as they were costly and sometimes caused trouble when there was severe ice loading.

Outdoor generators formed the subject of a question by Mr. K. W. Huddert. These, M. Ailleret replied, were used only in the South of France. All circuit-breakers and transformers were placed outdoors.

Mr. D. H. Tompsett asked for information on the nuclear station being built in co-operation with Belgium. M. Ailleret said that all the work that had been done in France in the atomic energy field had been with natural uranium. The use of plutonium for enrichment was not yet at their disposal, but it was thought that some experience with enriched uranium should be obtained without waiting for plutonium. An agreement between Euratom and the United States made it possible to build stations of the American type in Europe. Such a station is now being built, half paid for by France and half by Belgium. Those materials which did not come from the United States would be manufactured half in France and half in Belgium, and half the energy would go to France and half to Belgium. The station is located by the river at an unpopulated place in France two or three miles from the Belgian frontier. The contract was placed with Westinghouse for a pressurised reactor of 240 MW. It was the largest order that Westinghouse had had for a pressurised reactor, although M. Ailleret had been told that plans were being made in California for a 320 MW reactor.

M. Ailleret then said in reply to a question by Mr. C. O. Boyse, in connection with transmission line conductor vibration, that Stockbridge dampers were not used when building a line. The line was kept under observation by vibration recorders. Under French conditions only one-tenth of the lines vibrate, and in those places dampers were used. Other types of damping were being considered, and it had been found that a second conductor for a short length seemed to have the same damping effect.

Higher transmission voltages were the subject of a query by Mr. D. B. Irving, to which M. Ailleret replied that voltages had a tendency to double every 20 years or so, and he thought that this would continue. The fact that hydro had not a great future in Europe would tend to decrease the transmission distances, but the power of transmission would go on increasing. The size of units had a tendency to increase, and atomic stations would be given even greater concentration. Recently they had been studying and buying the land for an experimental station at a voltage of around 700 kV.

Mr. C. P. Snow asked if any work had been done recently on concrete transmission towers. M. Ailleret replied that they were not cheaper than steel when the structure was above 15 metres high. On 63 kV lines some concrete work had been done, but very little. For 15 kV lines with French conditions there was no doubt that pre-stressed concrete was by far the best solution.

Thermal-Storage Heaters in Dwellings

THE Electricity Council has just published Utilisation Research Report No. 24 which deals with tests on the practicability of using thermal-storage block heaters in dwellings.

With the co-operation of H.M. Customs and Excise, 12 local authority houses were equipped with improved thermal insulation and each living room was fitted with two 1½ kW units (of a type designed primarily for commercial and industrial premises), with a 1 kW unit in each kitchen and hall, capable of preventing the temperature of these rooms from falling below 60, 55 and 50°F respectively, provided a mid-day "boost" was available and the living room temperature "topped-up" as and when required by supplementary heating.

The conclusions reported are that, with the water heater also on off-peak supply, such an all-electric house could be operated at annual unrestricted and off-peak consumptions of about 5,000 and 7,000 kWh (4,500 kWh plus 2,500 kWh) respectively, and at a total expenditure, at average tariff rates, of less than £60 per year, or 23s per week, at the same time presenting attractive load characteristics to the supply authority. The block heater consumption of about 4,500 kWh appears to be remarkably low for the results achieved.

Copies of the report may be obtained, free of charge, on application to the Electricity Council, Trafalgar Buildings, 1, Charing Cross, London, S.W.1.

New Books

The J. & P. Transformer Book. By A. Austen Stigant, H. Morgan and A. C. Franklin. Pp. 892; figs. Johnson & Phillips, Ltd., Charlton, London, S.E.7. Price 70s.

Those already familiar with this book will know it as a substantial work containing much useful general information and representing very good value for its price, although this ninth edition now costs £3 10s compared with 10s 6d for the eighth edition in 1941. Nine of the original chapters are now omitted and six added, and the appendices have been adjusted in similar proportions. The chapters omitted dealt largely with unusual transformer arrangements not now forming a part of the basic transformer technology and infrequently occurring in current practice. However, it is sometimes the unusual cases for which information is most needed, e.g. three- to single-phase transformation. As rectifier transformers also are now omitted it would appear the policy has been to take out all chapters dealing with special transformers and not merely to remove the dead wood.

On the positive side there are now chapters dealing with cold-rolled steel cores in their various forms, impulse testing and transformer oil. The chapter on Scott-connected transformers now also includes the Le Blanc connection for two- to three-phase transformation.

A surprising omission is the absence of any information on, or reference to, dry type transformers, except classes A and B. Information on the application of the various classes of dry type transformer and the insulation materials used in them is an essential part of a transformer book intended as a general guide. Non-inflammable cooling liquids such as pyroclor are neglected, as is also the general subject of cooling.

Existing chapters retained in the new edition have largely been rewritten to help to bring them up to date, and the majority of the diagrams and photographs have been replaced. The book contains enough material and useful information to be worth the price, particularly for the transformer user and purchaser, to whom the book is mainly directed.—F.T.B.

Electronics: A Bibliographical Guide. By C. K. Moore and K. J. Spencer. Pp. 411. Macdonald & Co. (Publishers), Ltd., 16, Maddox Street, London, W.1. Price 65s.

Two main functions are served by this book. It provides a list of the major works in electronics literature, including textbooks, articles and papers, and it offers a method by which any paper in electronics literature may be located. The guide covers the period 1945 to 1959 and is divided into 68 sections. The first contains a survey of reference works and lists the abstracting, bibliographical and translating services which deal with electronics and related fields. Each of the other sections is devoted to a specialist field, arranged in order according to the universal decimal classification system, and comprises a list of all relevant bibliographies, together with a selection of books and papers.

The information in each entry is presented under three columns, the first containing bibliographical details of the work quoted, the second giving the total number of references cited and the date of the first and last, and the third contains a brief annotation outlining the technical scope of the work quoted. For the purpose of this bibliography, electronics is regarded as science and technology based on the use of electron tubes or semiconductors. Conventional power frequency engineering, rotating electrical machinery, electrochemistry, X-rays and applications peculiar to nucleonics have been excluded, but both infrared and ultrasonic techniques have been dealt with.—T.R.W.

The E.A.W Electrical Handbook. 7th Edition. Pp. 312; figs. English Universities Press, Ltd., 102, Newgate Street, London, E.C.1. Price 15s.

This seventh, and completely revised, edition of the handbook prepared by the Electrical Association for Women is primarily designed as the textbook for the E.A.W. certificate in electrical housecraft. The 15 chapters are divided into three main sections covering general electrical principles, tariffs and methods of charge, and practical domestic applications with details of household wiring installations and methods and appliances for home lighting, space and water heating, cooking, refrigeration, laundry and household cleaning.

Electrical Principles. 3rd Edition. By H. Cotton. Pp. 423; figs. Cleaver-Hume Press, Ltd., 31, Wright's Lane, Kensington, London, W.8. Price 15s.

Initially written as an experiment to ascertain the reaction of teachers in technical colleges and grammar schools to an introductory text on the principles of electricity and magnetism using only the M.K.S. system of units, this book has now achieved a third edition. In addition to the usual revision one expects with later editions, this new version has been enlarged by the addition of further chapters on a.c. circuits. One deals with series and branched circuits, comprising two or three of the R, L and C circuit parameters, and also with the calculation of power. The second deals with electrical resonance in both series and branched circuits.

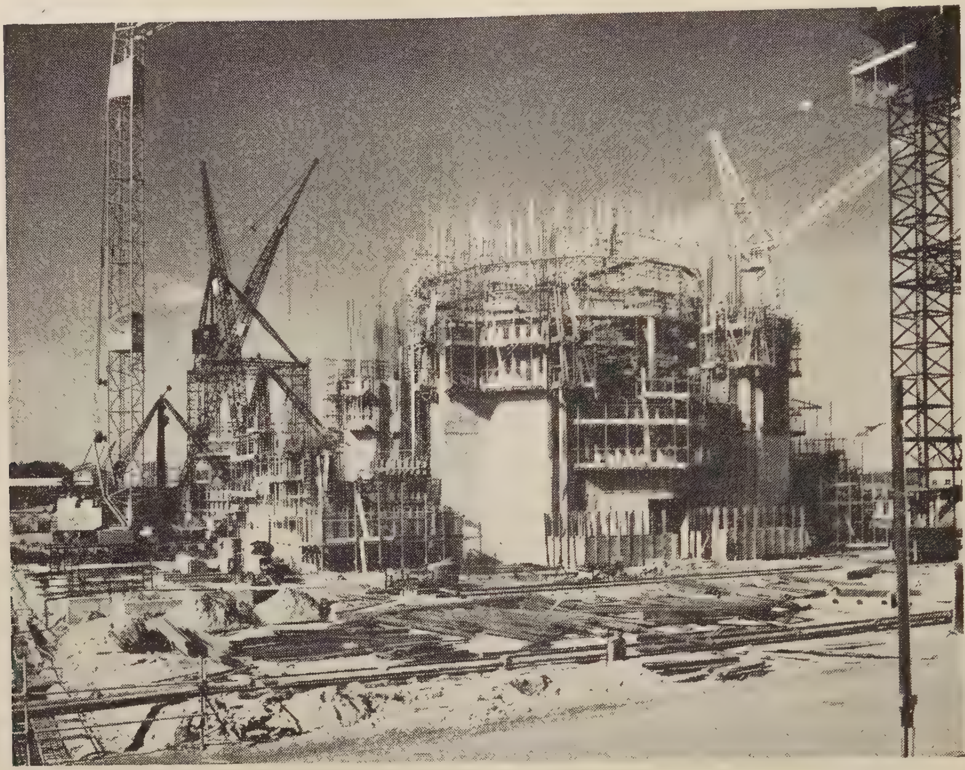
What's Wrong With the Unions? By Eric Wigham. Pp. 234. Penguin Books, Ltd., Harmondsworth, Middlesex. Price 3s 6d.

By going into the history of the trade union movement in this country, with special reference to particular unions, Mr. Wigham traces the origin of a number of practices which, although once justifiable, still prevail in very much altered conditions. He examines the present situation and makes suggestions for action by the Government, the Trades Union Congress, the Labour Party and employers in such matters as conciliation, the policy and aims of the movement, the governance and operations of the individual unions, long-term wage agreements, shop stewards' functions and " partnership " in industry.

Most of Mr. Wigham's proposals seem to be sound and worth trying, but he himself expresses a doubt whether the parties concerned will adopt any of them.—J.H.C.

CONSTRUCTION AT SIZEWELL

Good Progress with Nuclear Generating Station



Protective shield for No. 1 reactor at Sizewell under construction

WORK is ahead of schedule at the 580 MW nuclear power station which is being built at Sizewell, Suffolk, for the Central Electricity Generating Board by the English Electric, Babcock & Wilcox, Taylor Woodrow atomic power group. Foundations are half-completed for the 250ft high 400-ton capacity Goliath crane made by B. & W. which is now arriving at Sizewell for re-assembly, after having been used in the erection of the 500 MW nuclear power station at Hinkley Point. Also being used is a 10-ton capacity free-travelling Peine tower crane, weighing 200 tons and one of two made in Germany to Taylor Woodrow's special requirements. At present, this Peine crane is operating at reduced height but, when fully erected, the height from ground level to mast top will be 220ft, and with the lifting boom raised to its limit the maximum height will be 320ft. Electrically operated, with a total of 300 h.p., and Ward Leonard control for hoisting motion, the crane is capable of lifting a maximum load of 10 tons and is mounted on its own rails.

The 8ft thick foundation raft for both reactors and all the boiler houses has been completed, the concrete protective shield walls for No. 1 reactor are well advanced, while work has begun on the shield walls for No. 2 reactor. Most of the excavation has been completed in the pump house, through which 27 million gallons of water an hour will be pumped for the condensers, and the concrete is being placed for the foundation slab. As work is being carried out 30ft below sea level, water is being removed by deep well pumps, each pumping at least 30,000 gal/hr. Two tunnels are being driven out to the cooling water intake which will be some 1,800ft off-shore. In the north tunnel 240ft has already been driven, and work on the south tunnel is also well advanced.

In the turbine house, which will have two English Electric 325 MW turbo-alternators, all the bulk excavation has been completed, and work is going ahead on the inlet culverts for the circulating water and on the foundations for the walls. Work on the turbo-alternator block foundations is soon to begin. Fabrication sheds for the two steel reactor pressure vessels and the eight boiler shells, which will be welded on site, are being erected.

Initial work comprised laying about 2½ miles of concrete-based roads, the construction of sewage works, a camp to hold 400 men which has already been completed and is now occupied by about 170 men, a canteen, site offices, plant shops, carpenter's shop and auxiliary buildings. The labour force now numbers about 1,000 men.

At their Dalmuir Works in Scotland, Babcock & Wilcox are shaping and pre-forming the 4⅛in thick steel plating for the two 63½ft diameter reactor pressure vessels. Shop fabrication is also proceeding on the 22ft 6in diameter ring sections for the eight 91½ft high boilers.

Work began on site on 4th April last and it is expected that the station will be commissioned in 1965. Sizewell, the seventh station to be ordered in the United Kingdom, will have the highest output of any nuclear power station so far being built in the world and will bring the total power of Britain's nuclear stations to 3,000 MW, some 10 per cent of the country's present total generating capacity.

B.E.A.M.A.'s Golden Jubilee

MR. MACMILLAN AT CELEBRATION DINNER

THE Prime Minister, the Rt. Hon. Harold Macmillan, was the guest of honour at the Golden Jubilee Dinner of the British Electrical and Allied Manufacturers' Association last Tuesday at Grosvenor House, London, W.1. Mr. A. M. Browne, President of the Association, was in the chair and about 800 members and guests attended, including most of the electrical industry's leaders and men distinguished in many departments of public life.

Mr. Macmillan proposed the toast of the electrical and allied manufacturing industry. After an appreciative reference to the enormous strides made in the area covered by the industry since the B.E.A.M.A. was founded 50 years ago, he said that it was now possible to create unlimited energy which could be usefully employed or could raise a Frankenstein monster. Combination of scientific knowledge and engineering skill had made power ever cheaper. Under four years ago power stations were costing about £60 per kilowatt. Stations coming into service during the next two years would cost only £40 per kilowatt.

Earnings Abroad

The electrical industry was a great earner of foreign exchange; it brought in £300 million a year and the amount was still rising, particularly in connection with European trade. There had been a net decrease in our " invisible " overseas earnings and it was therefore vital to secure a balance on " visible " trade. In this the electrical industry must play a big part. We had many advances to show, including our nuclear power programme, our electronic control systems and computers. The industry had a very fine tradition of research and had produced remarkable results. He was sure that its efforts would not slacken. The B.E.A.M.A. had taken a leading part in the formation of the Electrical Research Association and the British Standards Institution and it had also been active in international co-operation.

The Prime Minister said that our present difficulties could be overcome by ensuring a prosperous and expanding economy based on reasonable prices. Planning was sometimes in fashion and sometimes unfashionable—it had now become fashionable. But in an island like ours we must make a pragmatic approach and not be tied down by theory. He thought that the Chancellor of the Exchequer's plans would enable us to make better use of our resources and lead to better understanding.

After a passing reference to the European Common Market which, he said, offered both advantages and disadvantages, opportunities and dangers, Mr. Macmillan mentioned the need for the developed countries to go to the assistance of those less advanced. He concluded by affirming that electricity had a yet greater part to play and he proposed the toast with great confidence in the future of the industry.

In his reply Lord Chandos, chairman, Associated Electrical Industries, Ltd., referred to the industry's problems in financing its rapid development and to the importance of the producer in the economy of the country. The electrical industry, Lord Chandos said, was a key industry in every sense of the word. If they looked forward to continued expansion and to higher standards of life in this century, the electrical and the chemical industries must be amongst the leaders. The electrical industry's output of machinery and apparatus was worth about £1,600 million a year, and its exports were around £300 million.

The electrical industry was also one of the greatest sponges of capital. This, Lord Chandos said, was because electrical engineers—and in some aspects of our business mechanical engineers—were so ingenious that they had an uncomfortable way of making new discoveries related both to the production and the use of electrical energy. Man's ingenuity had outrun his ability to finance his inventions. In the electrical industry they had to spend vast sums upon research and development, upon plant and equipment, while the conditions of trade were becoming increasingly tight and profit margins were under very severe pressure. The return on the risk capital had been falling steadily in the last few years. The prospects of Great Britain joining the Common Market would appear likely to intensify competition. They were all, Lord Chandos said, trying flat-out to improve their efficiency and to increase their profits, so that they could sustain the large bill for research and development which they must carry if they were to remain in the forefront of progress in this ever advancing, dynamic and changing industry.

Revenue from Industry

Lord Chandos said he believed that both in Government and in public opinion, the point of view of the producer was getting further and further into the background, whereas that of the so-called consumer was getting more and more into the foreground. Industry's contribution to revenue should be given more than a passing thought. The two companies with which he was concerned had, in the last ten years, paid to the Exchequer £248 million either directly or from their shareholders, whilst the shareholders got £131 million.

They must be careful not to protect the consumer to such an extent that the industry from which he derived his income was made bankrupt by the mere extent of the protection which he was supposed to enjoy.

On broad principles, Lord Chandos declared himself in favour of the Restrictive Trade Practices Act, but he pointed out that its extremely stringent application had been one of the causes which had made the electrical industry so difficult to run upon sound lines during the last year or two. Its timing, also, had coincided with the intense new competition coming from Germany, Switzerland and from Japan. He therefore made a plea that the producer should be rather regarded as the principal source of our wealth, someone even to be wooed and cosseted and not only exhorted and warned.

Referring to the Prime Minister's remarks on planning, Lord Chandos said that the electrical industry planned extremely carefully for many years ahead, and got a great deal of assistance from B.E.A.M.A. and its officers. Since it took a year to plan a new plant, including buying the site, nearly two years to build it, and another year to bring it to full production, they had to plan on a minimum of about a four-year programme. Frequently planning went wrong but some of their mistakes were the fault of the Government.

Of the total capital investment in the country, Lord Chandos continued, 40 per cent was for the Government, Government agencies, nationalised bodies, and so on, and about this investment all too little was known. Business hoped that the new planning body would bring together and publish information about the investment plans of these bodies.

Lord Chandos estimated that not far off 40 per cent of plant made by the electrical manufacturing industry went into Government use. Thus fluctuation in the Government's policy towards capital investment had a direct effect upon about 40 per cent of the electrical industry. Moreover, the vagaries of Purchase Tax and hire purchase affected quite a large part of the remaining 60 per cent, and made it extremely difficult not to interpolate a good deal of guess-work into their plans. "The greater part of the work of an overall planning body should clearly be directed towards forming a longer-term and more stable Government policy, since Government action over its own investment, interest rates and taxation is the key to the steady growth of our economy. This is a matter upon which B.E.A.M.A. has, to my mind very rightly, directed its attention, and it has made representations to this effect."

Referring to the strenuous efforts being made to keep B.E.A.M.A. up to date, Lord Chandos said: "Our rulers wil not find this body short-sighted or narrow-minded, or immersed in the belief that they can go on entirely on their own in the matter of prices and markets, or that all our mistakes are other people's fault: most of them are, of course, our own."

In conclusion he said that export margins were now becoming so tight that if prices at home were to be subjected to similar pressures, "we shall be forced either unpatriotically to cease export business or, patriotically and amidst the plaudits of the consumers and the economists, go bankrupt."

Mr. A. M. Browne wound up the proceedings by thanking the Prime Minister and the other guests for taking part in the Association's jubilee celebrations. He also expressed gratitude to the members, the director (Mr. Stanley F. Steward) and his staff for their co-operation and to Lord Chandos for his response to the toast.

POWER DEVELOPMENT IN ONTARIO

ECONOMIC conditions in Canada affected the operations of the Hydro-Electric Commission of Ontario in 1960, states the chairman, Mr. J. S. Duncan, in a foreword to the Commission's report. In consequence, progress in the latter part of the year failed to justify the promise of the earlier months, and the 3·4 per cent increase in power requirements was the lowest since 1949.

Net output during the year amounted to 37,700 million kWh, of which 31,500 million kWh was produced at the Commission's hydro-electric generating stations. Because of favourable water conditions, the demand on thermal-electric plant was comparatively small, but it may increase sharply at any time. Thermal plant capacity has been expanded over the past decade from a mere 53 MW to 996 MW and now represents 17 per cent of the total capacity of the Commission's stations. In the programme of construction it is predominant. Two stations—Richard L. Hearn and Lakeview—are to be brought up to 1,200 MW and at Douglas Point, near Kincardine, a 200 MW nuclear power station is being built in conjunction with Atomic Energy of Canada, Ltd.

In the sphere of transmission, surveying for a 460 kV line route from Pinard transformer station to the vicinity of Sudbury, a distance of 228 miles, was completed. The proposed designs submitted for 100 suspension structures to be installed on the first 30-mile section included guyed aluminium, guyed steel, tubular steel, and laminated wood structures, as well as conventional self-supporting steel towers. The selection of suspension hardware and the establishment of spacer and damper requirements for the line will be based on conductor vibration studies carried out on a test line erected for the purpose at Port Credit. At the Coldwater extra-high-voltage test project, corona and radio interference tests were continued on bundle conductors.

In order to overcome costly problems in tower foundation construction in the muskeg country through which the 460 kV line passes, the Commission has evolved a new technique. Expansion anchors of the type normally used on low-voltage lines are installed to normal depth in the soil underlying the muskeg, and are backfilled with mechanically tamped crushed stone. The usual uplift movement which occurs when load is applied, though permissible for guyed wood poles, was not considered tolerable for tower foundations. This uplift can be overcome, however, by mechanically preloading the expansion-type anchors to the required holding capacity. When released from this initial load, the anchors are sufficiently firm to withstand reloading through the design range with virtually no movement.

Space Flight Propulsion Devices

THE Midland Regional Council of the Association of Supervising Electrical Engineers is to present a special lecture, "Electrical Propulsion Devices in Space Flight," at the Wolverhampton and Staffordshire College of Technology, Wulfruna Street, Wolverhampton, next Tuesday at 7.30 p.m. The president of the Association, Sir Willis Jackson, will preside. Admission is by ticket obtainable from Mr. A. D. Nock, Chandolin, Orton Lane, Wombourne, nr. Wolverhampton (telephone: Wombourne 2077).

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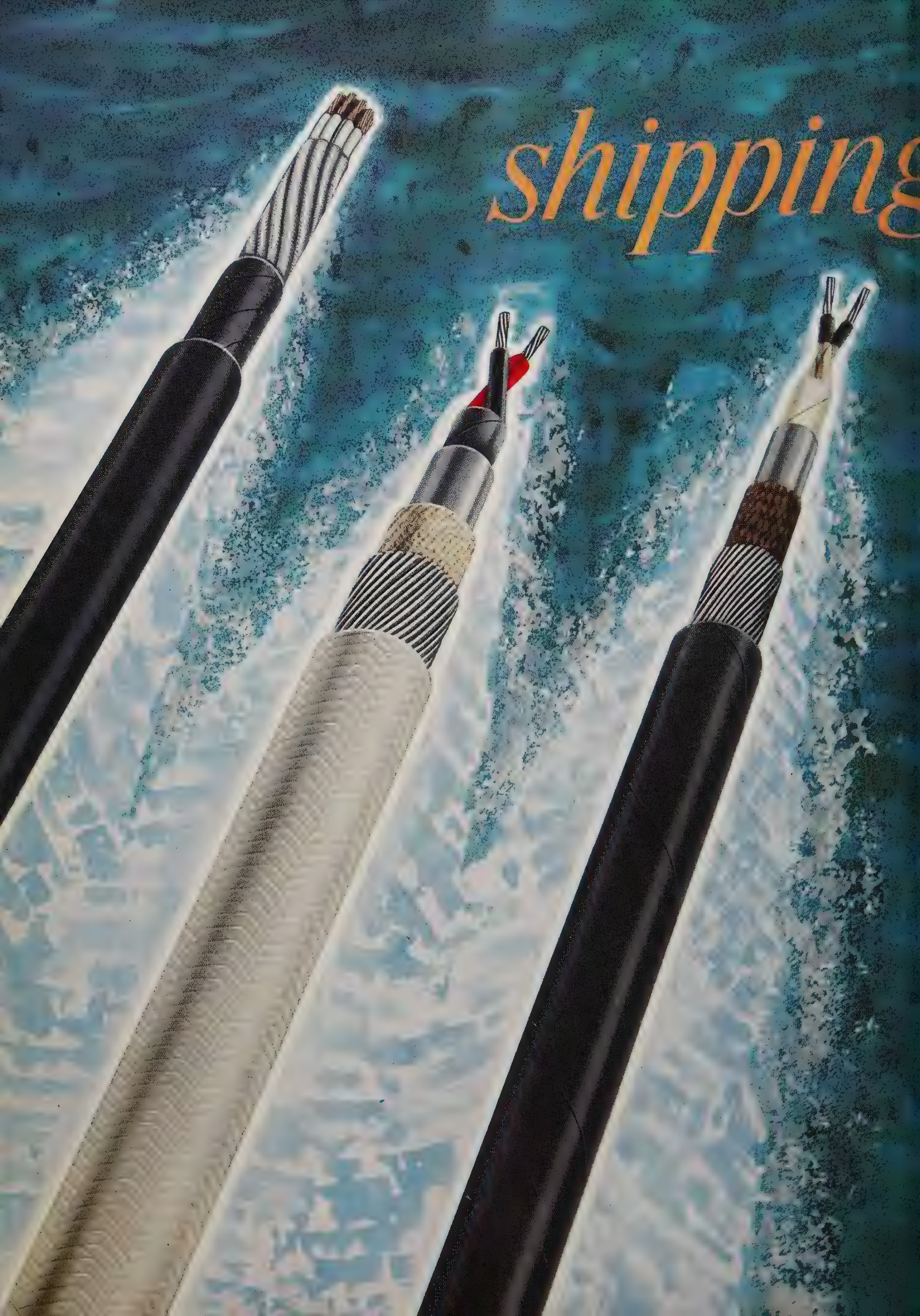

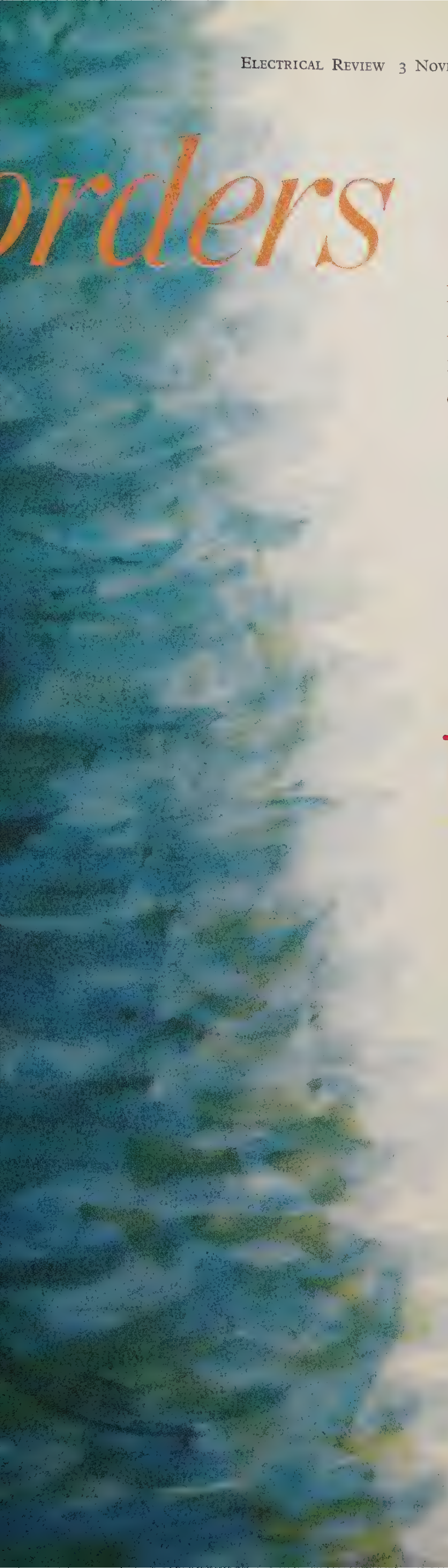

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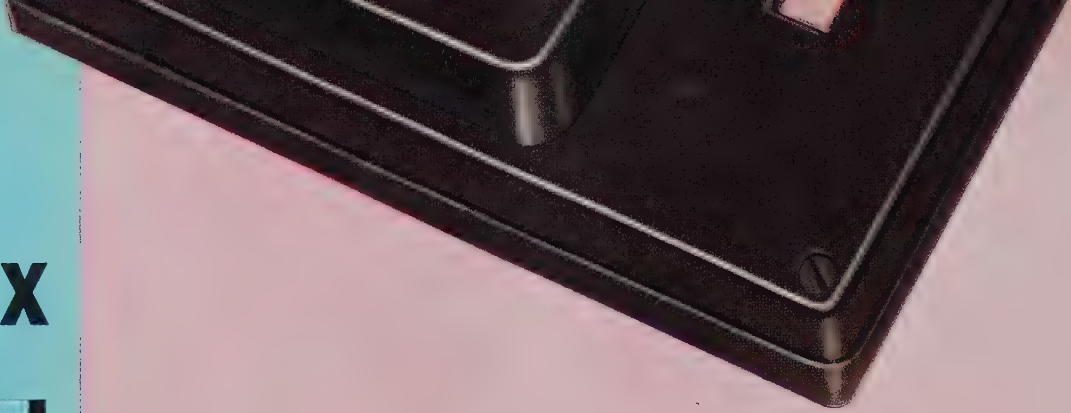

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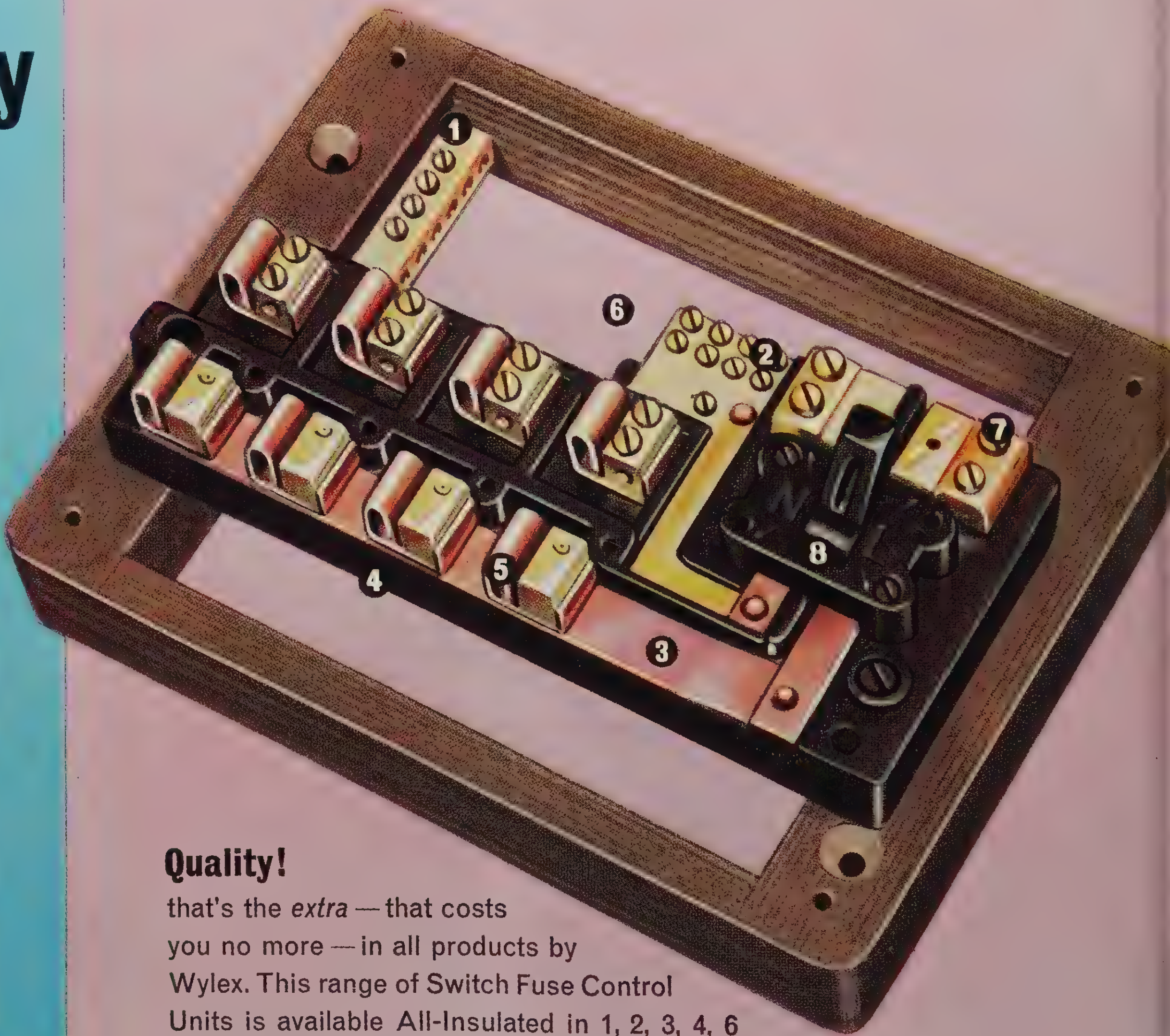

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VIEWS on the NEWS

By "REFLECTOR"

MR. J. I. BERNARD, Director of the British Electrical Development Association, comments on my reference to a smell about the oil companies' heating propaganda. He says that, generally speaking, there is no smell from an oil-heating installation until it has been in use for a year or more—by which time anyone who was rash enough to have an oil-fired boiler installed in a kitchen begins to wish he had put it in an outhouse.

> "As regards advertisements of comparative costs, they do not seem to have got beyond fourth-form arithmetic. For example, 18s 4d per week buys (at 1s 6d) 12 gallons of oil which (at 160,000 B.Th.U. gal) have 1,920,000 B.Th.U. gross which (at 70 per cent boiler efficiency) will produce 1,350,000 B.Th.U. input. The quantity of electricity necessary to provide this amount of heat is 394 kWh which will cost (at 0·925d/kWh) 35s 6d. Calculations of this kind, so often made by heating engineers, are purely theoretical and, fortunately for electric heating, do not bear any relation to heating costs in actual practice. In a recent report the Director of the Building Research Station stated: 'Comparisons of domestic heating systems cannot be made simply in terms of the cost per unit of heating.' In practice one finds there is very little difference between the cost of off-peak electric heating and oil heating—to which the oil man will no doubt say: 'Ah, but what temperature do you get with your electric heating?' This is another gambit of the heating engineer to which one can reply to the effect that both systems give automatic heating and the householder can, within limits, have any temperature he desires. In the ultimate analysis only two things matter: that he is satisfied with the degree of comfort provided and how much he has to pay for it. Judged on this basis and irrespective of B.Th.U.'s and air temperatures, off-peak electric heating has nothing to fear from oil-heating installations, the capital outlay on which is generally three times as much; although it must be admitted that there are so many badly heated houses in this country that there is plenty of scope for the development of both systems."

* * *

"Public lighting in Godalming leaves a good deal to be desired, compared with some towns," says the *Guildford and Godalming Times*. It goes on to report proceedings of the Town Council and its committees on the subject of lighting which have resulted in a recommendation from the Finance Committee "that no further action be taken at the present time to proceed with a comprehensive scheme for the improvement and renewal of the street lighting installations throughout the borough," although it is conceded that there may be special points at which the lighting might be improved. There is nothing unique about all this; other local authorities are just as reluctant to spend money on street lighting. I mention it only because I seem to recall that Godalming is one of the towns which have claimed to be the first in the country to have public lighting by electricity.

* * *

Joining in correspondence in the *Daily Telegraph* on "Eccentric Meters," a writer sarcastically says:—

> "Another type popular with the Electricity Boards is the accelerating meter, which gradually increases the number of units registered for the same consumption of current, as, unlike the meter used by the Gas Boards, its accuracy is not subject to legal requirements."

Some of the Boards may not have heard of this meter and will want to know where they can get it.

* * *

In New Zealand this instrument is known as a "creeping" meter. *Live Lines* (Wellington) reproduces a letter received by the Tauranga Electric Power Board from a consumer who said:—

> "It is several months since I informed your Te Puke office I had a creeping meter in my cowshed, and a fault in the hot water control. . . . This creeping meter cost me 12s a year and unknown to many consumers they are paying the same. But all good things come to an end and I am reluctant to pay my account until my meters register only what I use."

A footnote from the Board's chief engineer agrees that all good things come to an end. He found that the meters were actually running "slow" and they have now been corrected.

* * *

Load factor improvement is not a modern idea: it was being pursued half a century ago. In a report on the Turin Electrical Congress the *Electrical Review* of 3rd November, 1911, referred to a paper by M. Sartori on "The Load Factor" in the following terms:—

> "This paper runs briefly through the numerous uses for electrical energy and goes also into the question of charging. At Lausanne, it appears, a tariff is in force which sells at a varying rate according to the time of day and the time of year. A double meter is in use, which is very little more complicated than an ordinary meter for two tariffs. This is not described, but given a reliable instrument of this kind, this certainly seems an excellent method of flattening the peak."

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Fusing L.V. Supply Circuits

A WORKMAN unplugged a portable drill from a new 50 yd t.r.s. coil extension lead and went away to lunch. Fifteen minutes later a smoke detection device indicated a fire and investigation revealed that the coiled lead and a nearby bench were on fire.

Subsequent investigation revealed that the probable cause of the outbreak in the coil of extension cable was an undetected fault in the cable itself which had not been revealed, or perhaps had not been in existence, when it had been subjected to routine tests about three weeks earlier. This cable was connected to a 120 V a.c. supply transformed down from the 240 V mains and at first sight appeared to have been adequately protected by suitable fuses.

Unfortunately, when the permanent wiring in the workshop for this circuit was installed many years ago it had apparently been overlooked that fuses would be necessary in both legs of the secondary circuit, since the centre point of the transformer had been earthed in order to provide the minimum risk of shock to users of portable tools. It is thought that the absence of the second fuse caused the fault current in the cable to be sustained after the fuse in the one leg had blown.

The recommended practice to fuse both legs of the secondary circuit is, of course, published in all up-to-date regulations, but as this installation had given no trouble for many years and was installed by a reputable contractor no check had been made. It is thought that other users of this form of low-voltage supply for portable equipment could find that their installations are not so safe as they supposed.

Hull, Yorks. H. V. J. Harris,
Telephone Manager,
Corporation Telephone Department.

"Dowsing" for Buried Cables

WITH reference to the letter of Mr. I. R. M. Chaston on the subject of dowsing (*Electrical Review,* 20th October), he may be interested to know that some of his suggestions have in fact been the subject of somewhat desultory experimentation over many years. In 1946 and 1947 tests carried out in the Physiology Department at Leiden University and in the Physics Laboratory at Delft showed divining phenomena to be genuine and more widespread than normally assumed. The physical and physiological factors involved in the production of such phenomena have been shown to be particularly complex and present great difficulties to experimenters. Very often in a test situation psychological tensions alone will inhibit the reaction or give rise to false results.

That bodily functioning is explicable in terms of fundamental electrical and electro-chemical processes is, as Mr. Chaston indicates, the basis of modern medical science and the effects upon excitable tissue structures and upon cellular activity of various bands of the electromagnetic spectrum are very well known. The effects of electrostatic fields and of both constant and alternating magnetic fields are less well-researched and it is *prima facie* highly likely that it is in research into these latter phenomena that the physical answers will be found.

One can at least regard as more unlikely any hypothesis based upon the presence of weak electric currents. To cause stimulation of a motor nerve a low-frequency current must be applied. As the frequency of the stimulus is increased above approximately 100 c/s more intensity is required to produce a reaction until finally at about 10 kc/s stimulation ceases and Joule's law begins to operate significantly. However, the skin has normally a relatively high resistance to the passage of a low-frequency current and one of the results of this is the production of severe sensory stimulation at quite low intensities. As dowsers have not reported, so far as I know, any sensations akin to those experienced with low-frequency currents and yet experience a powerful and sometimes uncontrollable "pull" or "tug" of the dowsing instrument it would seem unlikely, at least failing further information, that the physical factors involved can be low-frequency electric currents.

Various physiological effects during a dowsing reaction have been recorded. These are mainly alterations in skin potential, changes in muscle tension and electrocardiogram changes.

The most comprehensive and detailed treatise on the subject is by Professor Soleo W. Tromp, a geophysical adviser to the United Nations, and is entitled "Psychical Physics" (Elsevier Publishing Co., London, 1949). About 1,500 valuable references are given therein. I also believe that some 60 recent papers on the effect of weak magnetic fields on human tissue are in the Library of Congress, U.S.A., and remain unpublished so far as I am aware, although the information from them is available.

Woking, Surrey. D. C. Shields, M.A., Ed.B.,
Electro Therapeutic Instruments, Ltd.

Utilisation Research

MY attention has been drawn to an error in the article in your issue of 20th October, based on my address to the Utilisation Section of the I.E.E. In the third paragraph it is stated that one of the Area Boards reports an annual consumption for hay drying of 30 million units. In fact, the consumption for hay drying alone is much less than this. The figure given applies to crop drying.

Leatherhead, Surrey. H. G. Taylor.

"INTRODUCTION TO INDUSTRY" COURSE

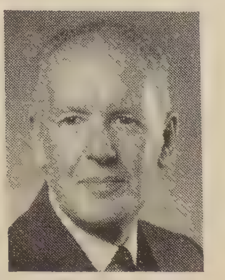
The Westinghouse Brake & Signal Co., Ltd., is holding a further "Introduction to Industry" training course at its Chippenham works during the week 8th to 12th January next. This is for sixth-form boys who will be taking G.C.E. "A" level examinations in scientific subjects in 1963. The course is designed to give boys at first hand a good insight into the engineering industry, how it works, and training facilities available and career prospects. Applications should be sent to the company's personnel superintendent at Chippenham, Wiltshire, by 1st December.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Dr. L. W. Brown, the assistant chief electrical engineer of Associated Electrical Industries (Manchester), Ltd., has been appointed technical director of the A.E.I. Lamp & Lighting Co., Ltd. He succeeds **Dr. A. B. Whitworth,** who is relinquishing his post on medical advice but will continue as technical consultant and director until his retirement next year.

Dr. L. W. Brown



Dr. A. B. Whitworth

Dr. Brown was trained as a physicist at King's College, London, and after working at the Telecommunications Research Establishment, entered the B.T.H. Research Organisation in 1943. He was transferred to Metropolitan-Vickers in 1950, becoming chief engineer of the Electronics Department and then assistant chief electrical engineer at Trafford Park in 1959. He has recently been responsible for engineering matters at Manchester in connection with the Heavy Electrical (India), Ltd., project.

Mr. N. R. D. Gurney, A.C.G.I., M.I.E.E., has recently been appointed general manager of Davy-A.E.I. Automation, Ltd. He is also a director of the company. Mr. Gurney was previously Manchester executive of the Heavy Plant Division of A.E.I.

Following the retirement through ill-health of **Mr. J. R. Halliday, Mr. John P. Evans** has been appointed manager of the Market Research Department of British Insulated Callender's Cables, Ltd. Mr. Evans, who is a graduate in economics and commerce, joined B.I.C.C. as an economist in 1960.

Mr. J. P. Evans

Mr. E. T. L. Wyton has been appointed export sales manager of the Osram Lamp Division of the G.E.C.

Mr. J. S. Buck, at present sales manager for the Yorkshire Area, will succeed him as area sales manager for the North West.

Mr. W. Morgan is appointed area sales manager for Yorkshire in addition to the North East Area and **Mr. R. W. Morgan** will be the area sales manager for South Wales in addition to the South West Area.

The Council of Industrial Design has appointed **Mr. Nigel V. Chapman,** B.Arch., Des.R.C.A., as industrial liaison officer for engineering consumer goods. He succeeds **Mr. Howard Upjohn,** who has joined Berkeley Associates, design consultants. Mr. Chapman was with the A.E.I. Lamp & Lighting Co., Ltd., from 1955 to 1957 and, more recently, he has been connected with the Revo Electric Co.

Mr. R. L. Higgin, A.M.I.E.E., who joined the Plessey Co., Ltd., in 1959 as group commercial executive, Components Group, has been appointed general manager of the group.

Mr. R. L. Higgin

Three hundred members and friends of the Social and Athletic Club at the Willesden switchgear factory of **Associated Electrical Industries, Ltd.,** enjoyed their annual ball at the Carlton Rooms, Maida Vale, on Friday, 27th October.

Among those present were Mr. C. F. Humphreys (chief engineer, Switchgear Division) and Mrs. Humphreys, Mr. H. Bush (works manager) and Mrs. Bush, Mr. A. Roxburgh (divisional assistant chief engineer, design) and Mrs. Roxburgh, and other members of the managerial staff.

On page 717 we report the formation by the General Electric Co., Ltd., of three new companies, G.E.C. (T. & E.) Holdings, Ltd., G.E.C. (Telecommunications), Ltd., and G.E.C. (Electronics), Ltd. **Mr. O. W. Humphreys,** C.B.E., B.Sc., M.I.E.E., F.Inst.P., F.R.Ae.S., who has been appointed executive chairman of the holding company and chairman of the two operating companies, joined the staff of the G.E.C. Research Laboratories at Wembley in 1925, becoming manager of the Laboratories in 1949 and director two years later. In 1953 he was appointed to the board of the company and his responsibilities were further broadened in 1959 when he became director for research and technical development. Mr. Humphreys is a vice-president of the Institution of Electrical Engineers and a past-president of the Institute of Physics. He has served as chairman of the Council of the Electrical Research Association, the D.S.I.R. Radio Research Board and national and international committees concerned with radio interference.

Mr. John Creek, M.A., has succeeded as managing director of Fibreglass, Ltd., Mr. A. H. Davies, M.A., O.B.E., who has become vice-chairman of the company.

Vickers-Armstrongs (Aircraft), Ltd., has formed a Systems Division with responsibility for all electric, electronic and integrated control and navigation systems design. Its work covers Vickers aircraft at Weybridge and Hurn, as well as British Aircraft Corporation projects, where Weybridge holds design authority in this field.

The new division is headed by **Mr. H. Zeffert,** A.F.R.Ae.S., A.M.I.Mech.E., Mem.A.I.E.E., as Chief Systems Engineer/E, with **Mr. M. H. Still** as his deputy.

Mr. Zeffert has been with the company for 20 years, largely in the design field, being appointed chief electrical engineer in 1955. His publications include "Principles and Practice of Aircraft Electrical Engineering." Mr. Still joined Vickers-Armstrongs at Elswick, Newcastle, in 1947 and was appointed deputy chief designer, weapon development, last year.

Mr. H. Zeffert

Mr. M. H. Still

The Association of Managerial Electrical Executive held a dinner at the Prince of Wales Hotel, Southport, on 26th October. A large number of members and guests attended, including Sir Josiah Eccles who has recently

Personalities at the Southport dinner of the Association of Managerial Electrical Executive. Left to right: Messrs. J. L. Ashworth, A. P. Whyte, F. Linley, W. J. Forster, A. D. Pluck and Sir Josiah Eccles

retired from the position of deputy chairman of the Electricity Council, and who was formerly chairman of the Merseyside and North Wales Electricity Board and before that city electrical engineer of Liverpool. Other guests included Mr. F. Linley, deputy chairman, North Western Electricity Board, and Mr. J. L. Ashworth, deputy regional director, North Western Region of the Central Electricity Generating Board.

Sir Josiah proposed the toast to the Association and Mr. W. J. Forster, president, replied. Mr. A. P. White, chairman of the Merseyside and North Wales Centre, proposed the toast to the guests to which Mr. J. L. Ashworth responded. The chair was taken by Mr. A. D. Pluck, chairman, North Western Centre of the Association.

Sir Eric Jones, K.C.M.G., C.B., C.B.E., who from 1952 until last year was director of the Government Communications headquarters at the Foreign Office, has joined Associated Electrical Industries, Ltd., as a consultant.

The guest speaker at the October luncheon of the **Batti-Wallahs' Society** in London last week was Mr. C. P. Storr, M.I.E.E. (A.E.I. (Manchester), Ltd.), who gave an account of life in India today based on his own personal experiences. Mr. W. N. C. Clinch (president) was in the chair and more than 120 members and guests were present. India, said Mr. Storr, was a country which had made considerable advances in recent years and was always planning for the future. It was now in the process of setting up its own heavy electrical engineering industry. Giving an indication of the magnitude of the industrial planning that was now going on, the speaker said that one big factory project would eventually occupy an area of more than 2 sq miles, employ 30,000 people and have an output valued at £40 million per annum. One of the biggest drawbacks at the moment was the shortage of competent and experienced personnel at managerial level. Dealing with the electric power output of India, he said that the generating capacity in 1960-61 was 5·7 million kW. It was planned for this to be increased to 23 million kW by 1977. A vote of thanks to the speaker was proposed by Mr. J. Temple-Hazell (past president).

The Marconi International Marine Communication Co., Ltd., announces that **Mr. I. W. Dick,** its resident representative in Singapore, is now to become the company's representative for South-East Asia.

Mr. Arthur Perry, A.M.I.E.E., senior assistant engineer (planning) for the Board's No. 4 Sub-Area, has been appointed sub-area engineer in succession to the late Mr. P. Blunt. Mr. Perry, who is 46, served his apprenticeship with the Cannock U.D.C. Electricity Department. He later joined the Norwich undertaking and on the nationalisation of the industry he was appointed engineering assistant (planning) with the Eastern Electricity Board. He took up his present post in 1949.

Mr. A. Perry

Following the completion of the merger between the Plessey Co., Ltd., Automatic Telephone & Electric Co., Ltd., and Ericsson Telephones, Ltd., **Mr. A. F. Roger,** chairman of A.T. & E., and **Sir Harold Wernher,** Bt., chairman of Ericsson Telephones, have been appointed to the Plessey board.

Mr. Gordon Singleton, Dip.I.E.S., left the General Electric Co., Ltd., on 30th October to join the board of S.L.R. Electric, Ltd., where his duties will include the broadening and promotion of the company's engineering and design services.

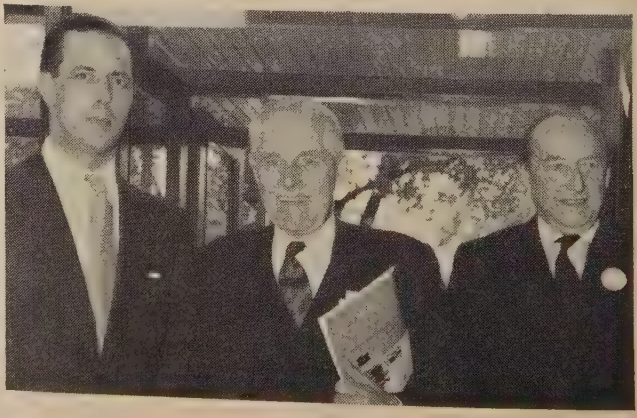
Mr. G. Singleton

At the annual general meeting of the Midlands Branch of the Electrical Trades' Commercial Travellers' Association last Friday the following officers were elected: Chairman, **Mr. G. W. Arnold;** vice-chairman, **Mr. G. A. James;** treasurer and charity steward, **Mr. C. Hyde;** secretary, **Mr. R. Wakelam;** employment secretary, **Mr. R. A. Capel.**

The board of Oerlikon Electrodes (Great Britain), Ltd., has been re-formed and **Mr. Robert Lakner,** Ph.D., M.I.W., has been appointed managing director. **Mr. H. O. Willrich,** Dip.Ing., A.M.I.W., and **Mr. F. W. Pinkstone,** A.M.I.W., are appointed directors.

Mr. G. B. Jones has been appointed secretary and chief accountant of Dynamo & Motor Repairs, Ltd., of Wembley and Birmingham, a company in the Metal Industries Group. Mr. Jones was previously a management accountant with Evershed & Vignoles, Ltd.

The annual dinner and dance of the Liverpool and District Branch of the Association of Supervising Electrical



Sir Keith Joseph, Minister of State, Board of Trade (left), with Dr. Percy Dunsheath, chairman of the Cambridge Instrument Co., Ltd. (centre), and Mr. D. A. Wilson, Board of Trade, at the opening of the Cambridge Co.'s extension reported in our last week's issue

At the Liverpool A.S.E.E. dinner (left to right):—Back row: Mr. R. N. Pegg (chairman, I.E.E. Mersey & North Wales Centre), Mr. W. G. D. Gregg (National Chairman, A.S.E.E.), Mr. J. R. Atkinson (chairman, A.S.E.E. Liverpool & District Branch), Mr. B. W. Hardacre (Branch secretary), Sir Willis Jackson (president, A.S.E.E.) and Mr. L. Harper (member of Executive Council). Front row: Mrs. R. N. Pegg, Mrs. J. R. Atkinson, Mrs. W. G. D. Gregg, Lady Jackson and Mrs. L. Harper

Engineers was held on 14th October at the Mecca Restaurant, Liverpool. Several leading A.S.E.E. personalities who attended may be seen in the photograph reproduced above.

Mr. Gordon Wansbrough - White, assistant to the group organisation and methods officer, Metal Industries, Ltd., has been appointed organisation and methods officer of the M.I. Group's largest subsidiary, Brookhirst Igranic, Ltd. Another Brookhirst Igranic appointment announced is that of **Mr. J. H. Comley** as production controller at the Bedford works. Mr. Comley was previously with another M.I. company, Foster Transformers, Ltd.

Mr. J. E. Bailey, B.A., Grad. I.Mech.E., has been appointed assistant superintendent, Petershill Works, A.E.I. Turbine-Generator Division.

Associated Electrical Industries, Ltd., announce two new appointments in the Heavy Plant Division.

Mr. J. A. Garrod, M.Eng., A.M.I.E.E., becomes engineer - in - charge, control equipments, Plant Applications Engineering Department, and **Mr. G. H. Sutton,** Assoc.I.E.E., is appointed commercial engineer-in-charge, Rolling Mills, Large Electrical Machine Sales.

Mr. H. Hewitt has been appointed deputy manager of the Atlas Lighting Laboratories, in addition to his present responsibilities as manager of the Lighting Development Group.

Sir Harold Wernher, chairman of **Ericsson Telephones, Ltd.,** recently made the annual presentations of long-service awards and certificates to employees who had completed 25 years with the company. The number of recipients—229—was a record for any one year, the previous highest being 64.

Mr. Robert T. Beaty has been awarded the first Hoover scholarship at Glasgow University. The new scholarship is one of two additional awards recently announced by Mr. H. W. Hoover, chairman of Hoover, Ltd., bringing the total to four. Mr. Beaty, who is 18, will follow a four years' honours course in electrical engineering.

Mr. Leslie Davies has been appointed a director of Pulsometer Pumps, Ltd., of Reading, with the responsibilities and title of works director.

Mr. G. D. Byam Shaw has recently been appointed to take charge of Crompton Parkinson's central organisation and methods service, based on their London office.

Mr. W. A. Train and **Mr. F. J. Goodall,** F.C.A., have been appointed to the board of W. H. Allen, Sons & Co., Ltd. Mr. Train has been works manager at Bedford since 1954. He joined the company as an apprentice and subsequently became technical representative for the East Midlands area. From 1949 to 1954 he was assistant sales manager. Mr. Goodall has been the company's chief accountant since 1958.

Mr. W. A. Train

Mr. F. J. Goodall

The Council for Scientific and Industrial Research has appointed **Dr. John V. Dunworth,** C.B.E., as deputy director of the National Physical Laboratory in succession to **Dr. G. Macfarlane,** who is shortly to take up the appointment of director of the Royal Radar Establishment, Malvern. Dr. Dunworth is at present deputy director of the Atomic Energy Establishment, Winfrith. The date on which he will take up his appointment will be announced later.

OBITUARY

Dr. B. L. Goodlet.—The death occurred on 27th October of Mr. Brian Laidlaw Goodlet, O.B.E., M.A., Sc.D., M.I.C.E., M.I.Mech.E., M.I.E.E., vice-chairman and former managing director of the Brush Electrical Engineering Co., Ltd., and director of Hawker Siddeley Industries, Ltd., and Hawker Siddeley Brush Turbines, Ltd. He was fifty-eight. Dr. Goodlet was born in Russia and received his education there and at Sheffield and Cambridge Universities. After training with the Metropolitan-Vickers Co. he served as technical assistant and research engineer with that company. He was appointed Professor of Electrical Engineering at Cape Town University in 1937; during the war he was for a short time Professor of Electrical Engineering at Birmingham University and later served in the South African Naval Force and at the Admiralty.

The late Dr. B. L. Goodlet

He then returned to Cape Town University but left in 1950 to become deputy chief engineer of the Atomic Energy Research Establishment, Harwell, and was later head of the Engineering and Research Division. He was largely responsible for the design of the Calder Hall reactors. In 1956 Dr. Goodlet went to the Brush Electrical Engineering Co. as chief engineer and director and soon afterwards he was appointed managing director, a position which he resigned in August on account of ill-health. Dr. Goodlet's work was recognised by the leading engineering institutions; the Institution of Mechanical Engineers awarded him the Thomas Hawksley Gold Medal, the I.E.E. the Kelvin and Overseas Premiums, and the Institution of Civil Engineers the Trevithick Premium.

Mr. Frederick Garside, sub-area commercial officer, No. 6 (Lakeland) Sub-Area, North Western Electricity Board, since 1953, died suddenly at his home on 25th October. Mr. Garside was 61 and before nationalisation he was for three years engineer and manager to Kendal Corporation.

INDUSTRIAL NEWS

Supply Industry Strike Threatened

RESUMED talks between the Electricity Council and the trade unions with members in the electricity supply industry, on 26th October, on the question of increased wages resulted in failure to agree and a threat of a strike. The employers' representatives made a final offer of a general increase of 1½d an hour in the basic rate with an addition for three years' service or more of 8s a week for skilled men and 5s for unskilled. It was proposed that the increases should take effect on 1st April next and should be repeated twice, at two-yearly intervals.

The unions had asked for £2 a week more and Mr. Frank Foulkes (E.T.U.), on their behalf, said that if it had not been for a desire to observe the "pay pause" called for by the Chancellor of the Exchequer the Electricity Council would have conceded the increase asked for, which was one which the industry could afford to pay. He calculated that it would put only one twenty-fifth of a penny upon the price per kWh paid by domestic consumers or one-eleventh on the industrial kWh. Mr. Foulkes said that the unions concerned would be instructed to call their members out on strike.

Bill Switchgear's New Bristol Offices

New branch offices and stores have been opened by Bill Switchgear, Ltd., at Clothier Road, Bristol, 4. The site is on the Brislington Trading Estate and there is ample room for car parking and transport. The premises, of modern design, are arranged with the offices and showroom on the upper floor and stores and dispatch department on the ground floor. The branch is in the charge of the area manager, Mr. W. L. White, and the stores manager is Mr. H. M. Jones. The telephone number is Bristol 79575/6.

A.E.I. and G.E.C.'s New Lamp Company

As foreshadowed earlier this year, Lamp Metals, Ltd., has now been registered as a private company with a capital of £750,000 to acquire part of the undertakings of the A.E.I. Lamp & Lighting Co., Ltd., and of the General Electric Co., Ltd. The new company, to be owned equally by G.E.C. and A.E.I., will manufacture wires and supports for filaments at present made separately by the two groups. It is part of a long-term policy dating back to the 1920's for the integration of the companies' interests in the electric lamp and radio valve industries. A previous joint company, formed in 1936, is Glass Bulbs, Ltd.

ELECTRICAL FIRES IN 1960

Over 62,000 fires occurred in buildings in the United Kingdom last year according to "United Kingdom Fire Statistics 1960," the first of a series of reports to be published annually for the Joint Fire Research Organisation by H.M.S.O., price 12s 6d. In 1959 there were 10,460 fires due to electrical causes and this figure increased in 1960 to 11,912. The major part of the increase is attributed to fires in cookers, but there have also been increases in the number of fires caused by electric heaters, radiators, radio and television sets and wireless and cable installations. However, those connected with electric irons, motors and refrigerators each showed a reduction.

SLOWER RISE IN ELECTRICITY SALES

AFTER maintaining an average increase of some 10 per cent over the preceding twelve months, Area Boards' sales showed only a modest rise of 3 per cent in August and in September the pace slowed down further to one of only marginal proportions. For the second month in succession the Midlands Board sold less electricity than in the corresponding month of 1960, and three other Boards—London, Southern and South Wales—also reported a fall in sales. To some extent weather conditions and the effective number of working days were responsible; allowing for these factors, the Electricity Council states that the national increase would have been 6·1 per cent instead of the actual figure of 0·8 per cent. As in August, the level of expansion was substantially higher in Scotland—8·9 per cent in the South and 7·4 per cent in the North.

ELECTRICITY GENERATED AND SENT OUT FOR PUBLIC SUPPLY

	Fuel consumed Thousand tons			kWh generated Millions			kWh sent out Millions	Output capacity MW
	Coal	Coke and Breeze	Oil	Steam	Water power	Total		
Central Electricity G.B.	3,623	66	363·3	8,402	7	8,414	7,890	28,058
North of Scotland H.E.B.	—	—	1·0	—	203	207	206	1,045
South of Scotland E.B.	259	1	0·8	501	26	527	497	1,804
Total for September 1961	3,882	67	365·1	8,903	236	9,148*	8,593	30,907
Corres. total for September, 1960	3,959	62	389·0	8,863	168	9,044	8,508	28,741
Inc. or dec., per cent	−1·9	+8·5	−6·1	+0·4	+39·8	+1·1	+1·0	+7·5
Total to date, 1961	37,761	628	3,929	87,629	2,104	89,854	84,499	
Total for corres. 9 months, 1960	35,577	673	3,766	82,371	1,798	84,275	79,304	
Inc. or dec., per cent	+6·1	−6·7	+4·3	+6·4	+17·0	+6·6	+6·6	

* This total figure includes generation by other methods amounting to 9 million kWh.

ELECTRICITY SENT OUT BY BOARDS FOR THEIR CONSUMERS

Board	Totals for September (million kWh)			Twelve Months' Totals Ended 30th September (million kWh)		
	1960	1961	Inc. or Dec.%	1960	1961	Inc. or Dec.%
London	609·0	602·0	− 1·1	8,662·1	9,292·2	+ 7·3
South Eastern	465·9	468·2	+ 0·5	6,116·7	6,615·5	+ 8·2
Southern	648·5	633·1	− 2·4	8,127·6	8,909·3	+ 9·6
South Western	301·3	308·9	+ 2·5	3,769·0	4,109·5	+ 9·0
Eastern	748·3	769·3	+ 2·8	9,735·9	10,531·1	+ 8·2
East Midlands*	650·4	665·1	+ 2·3	8,076·9	8,742·4	+ 8·2
Midlands*	858·3	842·6	− 1·8	10,661·6	11,414·9	+ 7·1
South Wales*	508·7	485·7	− 4·5	5,895.5	6,168·5	+ 4·6
Merseyside and N. Wales*	513·7	540·2	+ 5·2	6,271·2	6,876·2	+ 9·6
Yorkshire*	856·8	890·5	+ 3·9	10,388·5	11,705·0	+12·7
North Eastern*	488·3	494·6	+ 1·3	5,912·7	6,443·8	+ 9·0
North Western*	830·7	852·7	+ 2·6	10,366·9	11,402·1	+10·0
Total all Area Boards	7,479·9	7,552·9	+ 1·0	93,984·6	102,210·5	+ 8·8
Direct Supplies by C.E.G.B.	309·7	299·5	− 3·3	3,761·3	3,814·0	+ 1·4
Grand Total	7,789·6	7,852·4	+ 0·8	97,745·9	106,024·5	+ 8·5
Mainly Industrial Areas*	4,706·9	4,771·4	+ 1·4	57,573·3	62,752·9	+ 9·0
Mainly Non-Industrial Areas	2,773·0	2,781·5	+ 0·3	36,411·3	39,457·6	+ 8·4
South of Scotland E.B.	586·7	639·1	+ 8·9	7,702·6	8,690·5	+12·8
North of Scotland H.E.B.	133·7	143·6	+ 7·4	1,743·0	1,954·8	+12·2

* Those in which industrial consumers took over 50% of the total sales in the preceding financial year.

Chilton to Make Westinghouse Moulded Case Circuit-Breakers

CHILTON Electric Products, Ltd., has signed an agreement with the Westinghouse Electric International Company for the exclusive United Kingdom manufacturing rights of Westinghouse moulded case circuit-breakers. The agreement includes the non-exclusive sales rights for the rest of the world (excluding the United States and Canada).

Chilton will market a complete range of the latest design of Westinghouse "AB De-ion" breakers which represent a considerable reduction in size over earlier models. They will be made in ratings up to 1,000 A 600 V a.c.

The agreement marks an important phase in the development of Chilton Electric Products, which was founded 12 years ago and is still a private company. Initially it is planned to import the complete circuit-breakers from the Westinghouse Electric Corporation in the United States. This will be followed by assembly from imported parts and complete manufacture is planned to begin in two and a half years' time. By then Chilton expect to have doubled in size and a Stock Exchange quotation may also be sought.

Fuel Cell Consortium Formed

A new company, Energy Conversion, Ltd., has been formed to promote research into the development of fuel cells. Three British concerns, the British Petroleum Co., Ltd., British Ropes, Ltd., and the Guest, Keen & Nettlefolds Group are associated with the National Research Development Corporation in this venture.

The four parties have an equal share in the company, which has an authorised capital of £200,000, and the board will comprise Dr. F. E. King and Mr. T. G. McLintock (British Petroleum), Mr. H. Smith and Mr. J. R. K. Buckley (British Ropes), Mr. R. G. Lewis and Dr. T. Emmerson (G.K.N.) and Mr. J. C. Duckworth and Mr. H. J. Crawley (N.R.D.C.).

The N.R.D.C. has reciprocal arrangements with two American companies for the licensing of patents and interchange of technical information on fuel cells and it is intended that the benefit of these arrangements will now be transferred to Energy Conversion.

A spokesman for the new company said, "Our first tasks will be to recruit technical research staff and to obtain suitable premises, probably in London or the Home Counties. We shall then engage in an intensive research programme, with the ultimate aim of developing fuel cells which can be produced commercially."

Equipment by Air

During the first half of this year 40 per cent (by value) of the electrical equipment imported into this country was transported by air. This compares with 37 per cent of a lower total during the first half of 1960.

The value of electrical exports sent by air rose in the first half of 1961 but remained at 9 per cent of the total.

DUNDEE POWER STATION EXTENSION

Application has been made by the North of Scotland Hydro-Electric Board to the Secretary of State for Scotland for consent to extend Carolina Port power station, Dundee, and to bring forward to 1965 the commissioning there of the 120 MW set included in the Board's programme for 1966. A further addition is planned to follow within a few years.

The site available is well situated in relation to cooling water supplies and economical connection to the supply system, but because the fuel storage space is limited, the new plant is planned for oil-firing.

This increased capacity is needed to meet the growing demand of the Board's consumers and will restore to a suitable level the proportion of thermal to hydro-electric generation.

The present generating capacity of the Dundee station is 75·6 MW.

Electricity Board Panel See Fuse-Switches Tested in Italy

MEMBERS of the Electricity Boards' *ad hoc* panel on arc suppression coils and auto-reclosing switchgear, visited the C.E.S.I. Laboratories, Milan, on 17th-19th October as guests of Johnson & Phillips, Ltd., to see a new series of tests on the company's Type "D" expulsion fuse-switch.

Further development work on this unit, under the direction of Mr. P. T. Davies, B.Sc., A.M.I.E.E., manager of the J. & P. Switchgear Department, has recently been completed and during their visit the panel saw tests on the operation of the fuse-switch at various short-circuit values, with special reference to low current; operation of the associated repeater unit; discrimination between ground mounted oil circuit-breakers and expulsion fuse-switches; and also discrimination between fuse-switches of different current rating, the fuses being in series.

Miniature Packaged Substations

A new range of outdoor miniature packaged substations has been developed by South Wales Switchgear, Ltd., in which the height of units has been reduced from 8ft to 5ft 3in. The new switchgear units, which will accept the standard range of the company's oil circuit-breakers, have been short-circuit tested at K.E.M.A. (Holland) at 250 MVA, 6·6 kV and 11 kV. New low-height distribution transformers have also been developed for incorporation in the packaged substations

INDUSTRIAL NEWS *[continued*

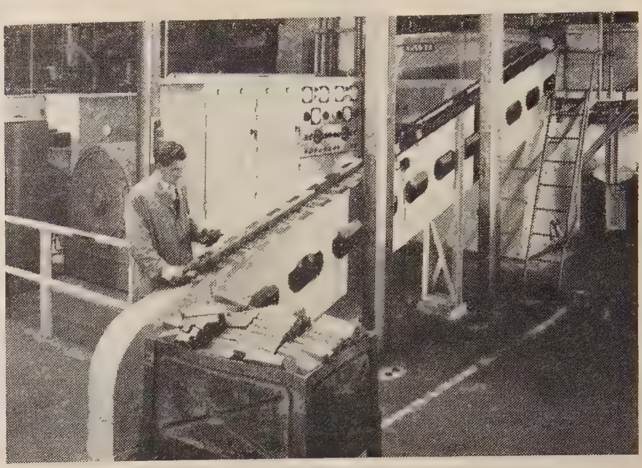
Painton Factory Expansion

A development scheme costing half a million pounds now being carried out by Painton & Co., Ltd., electronic component designers and manufacturers, will provide additional manufacturing and office space on an eight-acre site adjoining their existing factory at Northampton. The first phase of the building programme is nearing completion and the next stage awaits the sanction of the Board of Trade. The new buildings, designed by Wallis, Gilbert & Partners, will include a manufacturing area, a workshops and services area, and a seven-storey laboratory and administration block. Features of the scheme, which has been designed as a complete industrial unit with an extensive landscaping layout, include the use of lightweight preformed concrete slabs for the walls and roofs of the manufacturing buildings and combined heating, lighting and busbar strips in the roof areas.

Kenwood to Move to Havant

The Kenwood Group, makers of domestic and commercial kitchen equipment, are moving their headquarters at the end of the year from the original factory at Woking to Havant, where a £600,000 factory was opened earlier this year. Extensions to this new plant will be completed by 31st December to accommodate the move. Mr. Kenneth Wood, founder and managing director of the company, said that by moving to Havant they would be able to rationalise production and strengthen their expansion in world markets.

INDUCTION HEATER FOR MOTOR FACTORY



G.W.B. two-tunnel induction heater for forging manganese-molybdenum billets at the Longbridge factory of the Austin Motor Co.

To replace three oil-fired furnaces, the Austin Motor Co., Ltd., have installed a two-tunnel induction heater for the forging of manganese-molybdenum billets at their Longbridge factory. This new furnace, specially designed by G.W.B. Furnaces, Ltd., will do twice the work of the three conventional type furnaces. Connecting rods for British Motor Corporation engines are finally produced from the billets.

The new furnace will heat 6½ lb billets to a temperature of 1,250°C at the rate of one every 14 seconds. Pneumatic interlocked pushers operate at a preset time cycle and load one billet into the two coils alternately. After heating, the billets fall on to an inclined chute which delivers them to a reducing roll.

The heating coils are formed from high conductivity water-cooled conductors, each coil being 58in long. Power is obtained from two 300 kW, 2,500 c/s motor-alternator sets. Automatic power factor correction is included.

ROAD MAP

We have received from Rist's Wires & Cables, Ltd., a map showing through roads and motorways which is accompanied by a calendar of sporting events and several useful tips for the motorist. The map is free of charge and copies can be obtained upon request from the company's Publicity Department at Lower Milehouse Lane, Newcastle, Staffs.

Lighting the New Tamar Bridge

The new suspension bridge across the River Tamar between Devon and Cornwall, showing the lighting installation carried out by the G.E.C. Lighting and Heating Group. The lanterns, equipped with "Osram" 200 W linear sodium lamps, are mounted on 25ft tubular steel columns

POWER STATION SITE SAFETY

A film has been produced by the Central Electricity Generating Board dealing with accidents at power station sites during construction. Although this work is carried out by contractors, the Board is concerned with the safety of those employed indirectly, and this film has been produced for showing on construction sites, with the co-operation of the contractors, to make workmen safety conscious. Entitled "Survival," it depicts an accident at a typical site, the ensuing inquiry, the reactions of the other workmen, and the appointment of a site safety officer. It is intended to be thought provoking and somewhat controversial and those responsible for its showing are asked to leave time for discussion at the end of each performance.

The film was made for the C.E.G.B. in consultation with the Film Centre, Ltd., by Greenpark Productions, Ltd. It is in 16 mm black and white, and runs for 23 minutes. Copies can be obtained on request from the Board at Winsley Street, London, W.1.

MINIATURE CIRCUIT BREAKERS

INCORPORATING OVER

35 YEARS DESIGN EXPERIENCE

MODELS S101 AND S111 FOR THE PROTECTION OF LIGHTING AND POWER CIRCUITS SUITABLE FOR A.C. OR D.C.

Models S101 and S111 with ratings from 0·3 to 25 amps are suitable for A.C. or D.C. circuits. They are designed to screw into a standard 25 amp Edison E27 Fuse Base or a 60 amp Fuse Base providing a reducing ring is used.

The present range of STOTZ Miniature Circuit Breakers incorporates the results of more than 35 years' constant engineering developments and the accumulation of valuable experience as regards user's requirements as well as in respect of manufacture.

Other STOTZ Products:—

CONTACTORS - RELAYS - MICRO SWITCHES PRESSURE SWITCHES - THERMOSTATS BALLASTS - FLAME IGNITION CONTROL EQUIPMENT - EXPLOSION AND FLAMEPROOF SWITCHGEAR

Field of Application

The STOTZ Miniature Circuit Breaker protects lighting circuits and appliances of various descriptions against short circuits and overloads.

The STOTZ Miniature Circuit Breakers provide more reliable and efficient protection than ordinary fuses. Blown fuses cannot be used again whereas the STOTZ Miniature Circuit Breaker is

a permanent safety device.

Ask for details of our complete range of 1, 2 or 3 pole Miniature Circuit Breakers.

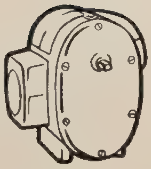
BRITISH BROWN-BOVERI LTD.

75 VICTORIA STREET, LONDON, SW1
Telephone: ABBey 5777 (3 lines). Telex No. 23448

270 STANDARD SPEEDS

from 57 mins. per rev. to 2,700 revs. per min.

No other motors offer the wide range of speeds, torques and programme switching of the versatile Drayton RQ. Conforming to BSS 170/1939, it is suitable for continuous or intermittent running; reversing; and can also be supplied with or without internal limit and programme switches. Motors giving a shaft rotation of more than one revolution before switching operates, or with multi-position switching, are also available. Write now for your copy of Data Sheet No. 302.



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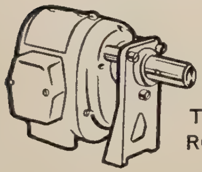

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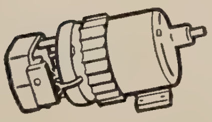

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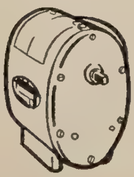

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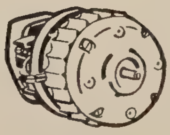

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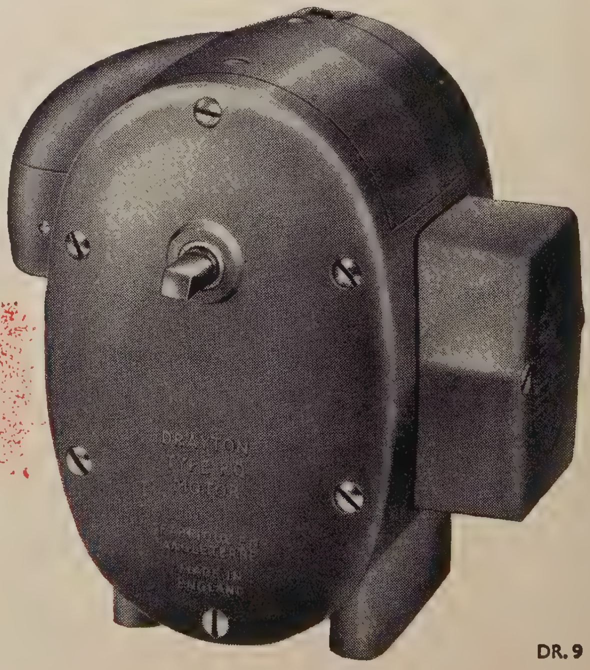
DRAYTON 'RQ' MOTORS



DRAYTON CONTROLS LIMITED
Bridge Works, West Drayton, Middx. *Phone: West Drayton 4012*

DR. 9

G.E.C. Telecommunications Group Reconstructed

TWO new operating companies, G.E.C. (Telecommunications), Ltd., and G.E.C. (Electronics), Ltd., have been formed by the General Electric Co., Ltd., to take over the activities of the company's Telecommunications Group.

Co-ordination and direction of these companies will be undertaken by a newly formed holding company, G.E.C. (T. & E.) Holdings, Ltd., which will also be responsible for co-ordinating and directing the activities of the following subsidiary companies: M-O Valve Co., Ltd., Salford Electrical Instruments, Ltd., Watson & Sons (Electro-Medical), Ltd., Machlett X-Ray Tubes (Great Britain), Ltd., and of the G.E.C. Semiconductor Division.

Mr. O. W. Humphreys has been appointed executive chairman of the holding company and chairman of the two new operating companies; Mr. W. A. C. Maskell, director of the holding company; and Mr. C. Riley and Mr. R. J. Clayton, directors and general managers of G.E.C. (Telecommunications), Ltd., and G.E.C. (Electronics), Ltd., respectively. Other appointments to the boards will be announced in due course.

The headquarters of G.E.C. (Telecommunications), Ltd., will be at the G.E.C. Telephone Works, Coventry, and of G.E.C. (Electronics), Ltd., at Union Works, Wembley. The main production units of G.E.C. (Electronics), Ltd., will be at Spon Street and Ford Street, Coventry, Broad Oak, Portsmouth, and Union Works, Wembley.

Electrical Rock Breaking

A non-explosive method of breaking rock with r.f. electrical power is being studied by the U.S. General Electric Co. in co-operation with the Montana School of Mines under a research grant from the Anaconda Company. This process, known as electrothermal forcing, employs electrodes clamped to the rock and connected to a r.f. source. This creates a current-conducting path through water trapped in the crystalline structure of the rock and comprising up to 5 per cent of its bulk. Once established, this channel greatly decreases the internal resistivity of the rock, making it possible to pass high-energy direct-current power through the rock between the electrodes. The resulting heat produces a stress which is sufficient to split the rock along the path of conductivity. Although less force is required to break metal-bearing ores because of their lower initial resistance, the process will also work with hard rock such as granite and with rock materials normally considered non-conductors.

It is estimated that to provide a commercial rock-breaking system a 25 kW source in the 20-40 Mc/s range will be sufficient. High-energy impulses could be generated either by capacitor banks in parallel or by an impulse generator. Commercial models of this equipment are expected to sell for less than £21,400.

CONTROL GEAR MOBILE SHOWROOM

A special demonstration vehicle has recently been designed and built for M.T.E. Control Gear, Ltd., by Bonallack & Sons, Ltd., of Basildon. The vehicle is intended to show a representative range of the company's electric motor control gear, multi-motor control panels, starters and electro-magnetic, disc-type brakes.

The vehicle is lit by six 4ft fluorescent strips and a roof light, with independent strip lighting for the display panels. Six thermostatically controlled tubular heaters and a Clayton Dewandre heater, mounted in the front bulkhead, provide the necessary heating. All electric circuits are connected to a central distribution panel, the electricity being obtained either from mains or from a trailer power unit drawn by the vehicle.

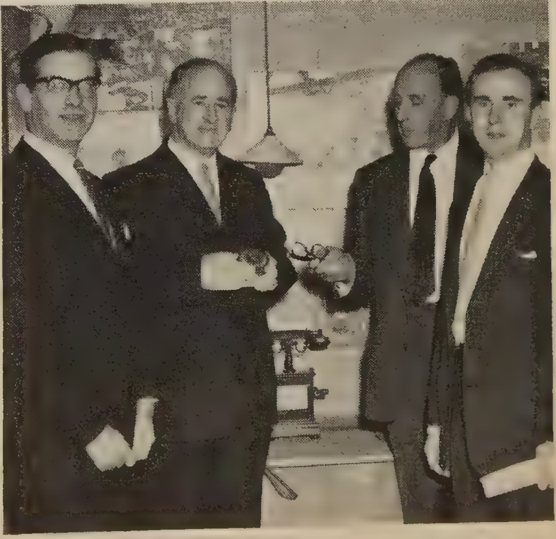
GAS BLOWERS FOR DUNGENESS

The Heavy Plant Division of Associated Electrical Industries, Ltd., is manufacturing the eight gas blowers to be installed in the nuclear power station now being built at Dungeness for the Central Electricity Generating Board by the Nuclear Power Group. With two reactors in operation, the station will have a total net electrical output of 550 MW. The blowers, each incorporated in a boiler duct circuit, will circulate the carbon-dioxide gas to cool the reactors. The reactor gas circuit will be pressurised to 300 p.s.i., and the gas temperatures at the inlet and outlet of each reactor will be 250 and 410°C, respectively.

Each blower, of the single-stage overhung axial type and driven by an A.E.I. back-pressure steam turbine, will absorb approximately 9,000 h.p. at normal speed and will be capable of dealing with $1\frac{1}{4}$ tons of carbon-dioxide per second. The blower casings will be spherical with a diameter of approximately 15ft and will have four flanged branch openings of 6ft 6in diameter.

Cantor Lectures on Export Problems

The three Cantor Lectures of the Royal Society of Arts will this year have the general title "Some Problems of British Export Trade." They will be given on Mondays, 20th and 27th November and 4th December at 6 p.m., at the Society's headquarters in John Adam Street, London, W.C.2. The individual speakers will be Mr. J. L. S. Steel, "Exports and the Country's Economy," Mr. Reay Geddes, "Production for Export," and Mr. Roger Falk, "Overseas Marketing."



The three principal speakers and the director of the British Lighting Council at the first of three conferences on office lighting during Office Lighting Week. The photograph was taken in a part of the exhibition of "One Hundred Years of Office Lighting" now being held at the British Lighting Council's Lighting Demonstration Centre in Lancaster Place, London. Left to right: Dr. H. H. Ballin, B.Sc.(Econ.), F.I.E.S.; Mr. W. F. Evans, H.M. Deputy Chief Inspector of Factories; Mr. A. D. S. Atkinson, A.M.I.E.E., F.I.E.S.; and Mr. A. Wilcock, A.M.I.E.E., Dip.M.I.E.S.

INDUSTRIAL EQUIPMENT EXHIBITION

AT the Manchester Industrial Equipment Exhibition held recently at the City Hall many types of industrial and office plant were shown to demonstrate the scope for increased productivity by cutting labour costs and reducing overheads.

Associated Electrical Industries, Ltd., showed a range of models representative of some of their main division — switchgear, turbine-generator, traction, instrumentation and heating; the Automatic Telephone & Electric Co., Ltd., switching and signalling systems, also electronically controlled telephone equipment; Babcock & Wilcox, Ltd., industrial boiler plant; and International Combustion, Ltd., models of a 550 MW twin furnace reheat boiler unit. On the individual stands there was a wide range of machinery, electrically operated, for numerous industrial applications, for instance voltage stabilisers, valves and transistors by Claude Lyons, Ltd.; portable electric feeders, etc., by Podmores (Engineers), Ltd.; electric trucks of various kinds by Powell & Co.; control panels, relay assemblies and timers, by Royce, Thompson Electric, Ltd.; industrial and commercial fluorescent lighting units by E. J. Schofield & Co., Ltd.; and electrical tubular heaters by Bertram Thomas (Engineers), Ltd.

A.E.I. BUCKIE FACTORY EXTENSION

Plans for a 10,000 sq ft extension to their Buckie, Scotland, factory are announced by the A.E.I. Lamp & Lighting Co., Ltd. The extension will increase the floor area of the factory by half. The existing factory was opened in 1956 and employs 120 workers. It was built by the Industrial Estates Management Corporation for Scotland which will also build the extension. Over 100 different types of lamps, including all the company's decorative tubular, telephone and g.l.s. rough service lamps are made at the factory. It is hoped that work on the new extension will start early next year.

Domestic Refrigerator Deliveries

Deliveries of British-made domestic refrigerators to the home market during August totalled 52,547. Although this was 2·6 per cent less than in the same month last year, when deliveries totalled 53,930, there is a steady demand for domestic refrigerators at the present time. During the first eight months of the year deliveries to the home market totalled 695,224. Deliveries to overseas markets during August amounted to 7,458, a decrease of 2·5 per cent on August, 1960.

U.S. CONTRACT FOR ENGLISH ELECTRIC

THE Grand River Dam Authority of Oklahoma, U.S.A., has awarded the English Electric Corporation of New York a contract worth some \$2½ million (£900,000) for four 35,000 h.p., 90 r.p.m., Kaplan water turbines with a runner diameter of 220in for a new dam and power station on the Grand River at Markham Ferry, Oklahoma.

The turbines will be manufactured by the John Inglis Co., Ltd., of Toronto, an associate of the English Electric Co., Ltd. The design work will be done by the company's Hydro-Electric Division at Netherton and the model testing and development will be carried out in their hydraulic laboratories at Rugby. The consulting engineers for the project are W. R. Holway & Associates of Tulsa, Oklahoma, who have also been responsible for the construction of an earlier dam at Pensacola on the Grand River.

Markham Ferry will be a gravity and rock filled dam, operating at a mean head of 55ft. As well as providing a measure of flood control, the new power station will supply the State of Oklahoma with an additional 100 MW of power.

Publicity for British Trade

A PARTY of representatives of member firms of the British Electrical and Allied Manufacturers' Association last week visited the London headquarters of the Central Office of Information to study ways in which industrialists can co-operate with the Government information services in supporting export trade. Publicity for Britain's industrial achievements is firmly established as a continuing theme in the overseas information services. C.O.I. services include the production of press material, films and television, tape recordings for use by the many overseas radio stations, the distribution of newspapers, periodicals and industrial prestige material and the production of exhibitions and displays.

Representatives of member firms of the B.E.A.M.A. at the Central Office of Information. The party included: Mr. G. M. C. Peacock (Babcock & Wilcox), Mr. H. H. Lusty (A.E.I.), Mr. S. L. Hendriks (A.E.I.), Mr. T. A. Fairhurst (G.E.C.), Mr. W. McMillan (Standard Telephones & Cables), Mr. D. N. Marrison (A. Reyrolle & Co.), Mr. E. N. Reeve (Brookhirst Igranic), Mr. D. C. Smith (Hoover), Mr. A. Cox (English Electric Co.), Mr. G. F. Jukes (Belling & Co.), Mr. M. Thwaites (B.I.C.C.), Miss Beigal (Thorn Electrical Industries), Mr. A. F. Galpin (Crompton Parkinson), Mr. P. J. D. Home (Crompton Parkinson), Mr. W. Hucker (B.E.A.M.A.), and Mr. A. V. Cottam (English Electric Co.)

Proposed Tariff Changes in Belfast

IN his report for the year ended 31st March last, Mr. R. P. Watson, city electrical engineer and general manager, Belfast, recommends new general tariffs to take effect after the meter readings for the first survey period in 1962. It is proposed that a private residence tariff should be introduced for supplies of electricity used exclusively for domestic purposes. The price to be charged per quarter will consist of a fixed charge depending on the rateable value of the premises and a running charge of 1d/kWh. On similar lines, there will be a combined business-residence tariff for supplies to premises used partly for business. Other tariffs, which will come into effect as soon as possible after the meter readings for the following survey period, are a flate-rate tariff and a prepayment meter tariff. These are optional alternatives to the tariffs mentioned above. The 5 per cent discount for prompt payment of accounts remains in operation.

The report records an increase in revenue of £225,000 over that of the previous year, the total being £4,622,859, and there was a net surplus on the year's working of £317,305. This, together with the balance of £82,792 brought forward, gives a disposable sum of £400,098. A balance of £100,000 remains for working capital after transferring £14,808 to the renewals fund, and applying £215,290 to debt redemption and £70,000 to miscellaneous capital works.

"Teleurope"

This is the title of a colossal production (9in by 12in; over 2,800 pages) covering about 189,000 firms in nineteen countries in the O.E.E.C. area. The first section of the work (of which this is the sixth edition) is an alphabetical index of the firms' telegraphic addresses; the second contains names, with telegraphic and postal addresses; and the third is a classified trades section with a key index. Explanatory notes are given in German, English, French and Spanish. "Teleurope" is published by the Deutscher Adressbuch-Verlag für Wirtschaft und Verkehr G.m.b.H., Holzhofallee, 38, Darmstadt, Germany; price £4 6s.

Australia and the Common Market

Speaking at the company's 32nd annual Motor Show dinner last week, Mr. John Oldham, O.B.E., chairman of Oldham & Son, Ltd., gave some impressions he had gained during a recent visit to Australia. He said that informed opinion in that country was not opposed to Great Britain's entering into the European Common Market. Australia was realising that the pattern of her trade was changing. She could no longer shelter behind the imperial preference screen and Japan had become one of her biggest customers. He believed that Great Britain's joining the Common Market was essential and inevitable if she were to be strong and stable enough to form the centre of a powerful Commonwealth and community of nations.

N.U.M. to Change its Name

The National Union of Manufacturers is proposing to change its name to the National Association of British Manufacturers. A decision will be taken at a meeting on 15th November. The purpose of the change is to remove ambiguity, particularly abroad, as to the association's function.

TRADE ANNOUNCEMENTS

The construction of the floor warming cables manufactured by **Tyrad Electric, Ltd.,** Imperial Court, Basil Street, Knightsbridge, London, S.W.3, has been revised, a high temperature p.v.c. insulation with p.v.c. sheathing now being employed. Also, a new resistance wire is now used for two of the ratings. The new cables have similar reference to the old but with the suffix "A."

A new company, **Shipton Automation (Sales), Ltd.,** is to be responsible for all the marketing activities of E. Shipton & Co., Ltd., R.F. Electronics Developments, Ltd., and the English Telephone Co., Ltd. The directors are Messrs. C. Will (managing), V. Younger, F. Jasper, L. Davis and O. Egert.

Dewhurst & Partner, Ltd., announce the appointment of Mr. E. Trattles as Western Area sales manager. His address is 56-58, Barton Street, Gloucester (telephone: Gloucester 25613).

On 1st January next the sales office of **Microwave Instruments, Ltd.,** will be transferred from North Shields to 98, St. Pancras Way, London, N.W.1, with Mr. M. F. Collings as technical sales representative. Apart from the "Microspin" electron-spin-resonance spectrometer, all microwave apparatus and components manufactured within the Hilger & Watts Group will be sold under the name of Microwave Instruments, Ltd. The "Microspin," which is an analytical instrument, will continue to be sold under the Hilger & Watts name.

The **English Electric Co.'s** Domestic Appliance Service Department Headquarters have been moved from East Lancashire Road, Liverpool, to new premises at Wilson Road, Huyton, Lancs. (telephone: Huyton 6211). The manager of the department is Mr. Charles Heap.

Hagan Controls, Ltd., a member of the Plessey Group, moved on 28th October from 14, Grosvenor Place, London, W.1, to Weedon Road, Northampton (telephone: Northampton 260). Its new address is near the existing Plessey Group development and manufacturing units whose facilities will be available to Hagan Controls.

The telephone number of the **Gresham Lion Group** companies operating from Gresham House, Hanworth, Middx., has been changed to Feltham 3655. They are Gresham Transformers, Ltd. (Power Division), Gresham Lion Electronics, Ltd., Gresham Automation, Ltd., and the Gresham Lion Group, Ltd. The number of Gresham Transformers, Ltd. (Small Transformer Division), Hanworth Trading Estate, Hanworth, Middx., remains Feltham 6661.

The telephone number of **Bowthorpe Holdings, Ltd.,** and of its subsidiaries, Hellermann, Ltd., and the Bowthorpe Electric Co., Ltd., is now Crawley 28888.

The address of the commercial and administrative departments of the semiconductor division of the **General Electric Co., Ltd.,** is now Broadstone Works, Broadstone Road, Reddish, Stockport, Cheshire. Telephone: Heaton Moor 6351/60. Telex: 66752.

Flexello Castors & Wheels, Ltd., Slough, Bucks., announce the introduction of a range of industrial castors with "Superthane" (polyurethane elastomer) tyres for which a number of advantages are claimed. They are being produced in 6in, 8in and 10in diameters.

NEW ELECTRICAL EQUIPMENT

AIRCRAFT MICRO SWITCHES

An extension to their range of micro switches for aircraft applications is announced by **Dowty Electrics, Ltd.**, Tewkesbury, Glos. Hermetic sealing and low operating loads are the main features of this "Picaseal" unit which is designed to operate in ambient temperatures ranging from -75 to $+90$°C and at altitudes from sea level to 60,000ft. The snap action, double-pole switch is assembled on to contact posts which pass through glass/metal seals in a steel baseplate. Operation is by a dolly sealed at its pivot by a brass bellows to complete hermetic sealing of the contact chamber. By the provision of a seal through which the operating plunger passes, the compartment of the switch containing the return spring plunger bearing and upper portion of the dolly is sealed to "environment free" standards. At 60,000ft, the force on the plunger required to operate the switch is 10 lb, rising to only 11·5 lb at the full plunger overtravel of ⅜in. At sea level the minimum plunger release force from the switch operating position is 5 lb.

Switch operating characteristics are: distance to operate, 0·030in plunger movement; simultaneity of contact operation, 0·005in plunger movement; contact differential, 0·017in plunger movement; contact rating per contact set, 4 A resistive at 28 V d.c. Terminations are provided by flying leads, number coded and 6ft long.

FLUORESCENT TROUGH FITTING

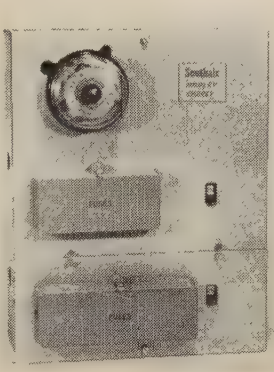
An industrial trough fitting designed to accommodate the 5ft 125 W fluorescent tube manufactured by Philips Electrical, Ltd., has been announced by the **Vanguard Engineering Co.**, Commonwealth Factory, Woolwich Church Street, London, S.E.18. The fitting incorporates appropriate control gear and will be sold complete with the tube at a retail price of £7 18s or if supplied with a reflector tube £8.

CONSUMERS' CONTROL UNITS

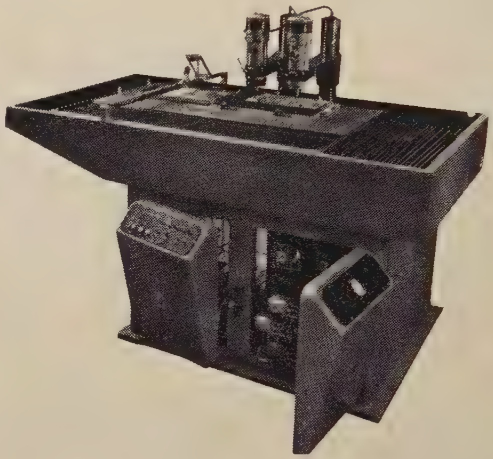
A range of consumers' control units, fuseboxes and contactors for off-peak heating and other loads, has been introduced under the name "Mainsmaster" by **Southair, Ltd.**, Horley, Surrey. These are suitable for a maximum load up to 14 kW on a 250 V supply. The double pole main switch is of 60 A rating and the contactor is also rated at 60 A but is a single pole unit with an a.c. energised operating coil. A 24-hour Sangamo Weston time switch is incorporated. Rewirable, interchangeable or cartridge fuses rated at 5, 10, 15, 20 or 30 A can be fitted. Thermal trip miniature circuit-breakers can be supplied in place of fuses, which remove the need to fit a separate isolating switch for each circuit of a permanent underfloor heating installation. The overall dimensions of the housing are 10¾in high by 13¼in wide by 3⅝in deep, and it can be arranged for surface or flush mounting. The composite control unit in the range has a separate compartment containing 4, 6 or 8 fused ways and a 60 A double pole switch for general services in addition to the off-peak loads. The control units can be supplied fitted with a contactor but not the time switch if required, 60 A single pole contactors being available separately. Also introduced is a range of triple pole contactors with ratings of 15, 25, 30 and 65 A per pole.

PRINTED CIRCUIT DRILL

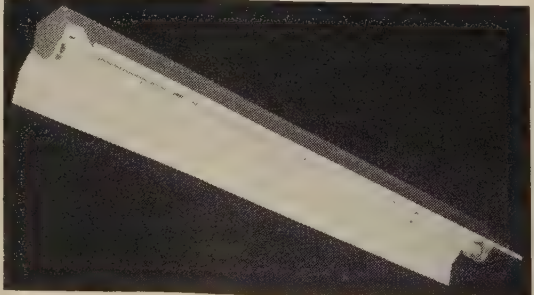
A fully automatic printed circuit drill, designed for drilling component fixing holes in printed circuit boards, has been introduced by **Ferranti, Ltd.**, Hollinwood, Lancs. Basically, the machine consists of two drilling heads allowing either tandem or single spindle working; a hydraulically-operated co-ordinate table carrying the printed circuit boards which is automatically moved to bring the board hole centres in turn below the drills; and a control system for the drilling action and table movement which enables the machine to work un-



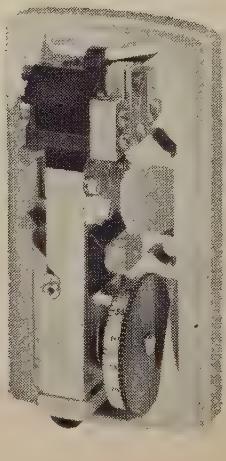
Above: Southair "Mainsmaster" composite consumers' control unit



Right: Ferranti automatic drill for printed circuits



Above: Vanguard Engineering 5ft fluorescent trough fitting



Right: G.E.C. type 628 thermostat with the cover removed

Pifco low-voltage blanket with control unit and (below) the Windak low-voltage blanket with restyled transformer

attended except for loading and unloading. The drilling table, which covers an area of 20in by 14in, has a positional accuracy of ±0·001in and repeatability is within 0·001in. Drilling is carried out to a grid system. A typical pitch is 20 threads per inch giving a spacing between rows of 0·050in or multiples thereof.

The machine can accommodate a single stack—up to ⅜in deep—of one or more printed circuit boards with dimensions of up to 12½in by 18in with maximum drilling dimensions of 11½in by 17½in. Alternatively, it can accommodate two stacks of identical boards for simultaneous drilling with dimensions up to 12½in by 8½in with maximum drilling dimensions per board of 11½in by 7¼in. The rate of output of completed boards is dependent on the pattern of holes to be drilled and the number and thickness of boards forming the stack. For example, two stacks of four boards requiring 288 holes per board are completely drilled in 14½ min. The machine operates from a 3-phase a.c. mains supply, the loading being approximately 1·5 kVA. Chuck capacity is 0-5/32in and the maximum drilling thickness in synthetic resin bonded paper is ⅜in.

THERMOSTATS

The type 628 thermostats just announced by the Lighting and Heating Group of the GENERAL ELECTRIC Co., LTD., Magnet House, Kingsway, London, W.C.2, are intended for industrial, commercial or domestic applications. No baseplate is required as the units can be screwed on to any B.S. conduit box or any flat wall. The adjustable temperature-scale indicator is fitted with a protective window to prevent unauthorised interference. The temperature differential is 2°F. The range includes standard models for 20 A 250 V or 10 A 440 V, priced at £2 15s each, and parallel or series switched models with these ratings, priced at £3 each. In each case the temperature range is 40-80°F.

WIRING ACCESSORIES

A combined switch socket outlet/fused spur unit and a series of 20 A double-pole a.c. switches have been added to the range of wiring accessories produced by the Cable Division of ASSOCIATED ELECTRICAL INDUSTRIES, LTD., 145, Charing Cross Road, London, W.C.2. The combined switch socket outlet and fused spur unit is for flush mounting and comprises a 13 A 3-pin shuttered switch socket outlet to B.S. 1363 and a 13 A switched fused spur unit mounted on a moulded front plate, measuring 5⅝ by 3¼in and suitable for fixing to a two-gang box of B.S. 1299 type. The unit is available with or without pilot lights. Terminals are suitable for ring circuit wiring and the switches incorporate nylon dollies and silver contact faces. The unit is suitable for cartridge fuse-links to B.S. 1362 and is supplied fitted with a 13 A fuse-link. It is available in brown or white.

Designed primarily for water heater control, the 20 A range of switches can also be used for floor heating control and comparable functions. They are available for surface or flush mounting, as one- or two-gang units, with or without pilot lights, and are fitted with nylon dollies. Flush switches are mounted on a 3¼in square front plate, either moulded or metal, suitable for fixing to B.S. 1299 boxes. Cast iron boxes can be supplied to which the flush switches can be fixed to form surface mounting units. Earth terminals are provided, one for each gang, and are suitable for looping connections if required, but also provide an automatic connection with the fixing screws. The surface switches are designed to comply with Clause 207G of the 13th Edition (1955) of the I.E.E. Wiring Regulations. Cables can enter from either end, or both from one end. Knock-outs are provided for twin cable or twin with earth continuity conductor, either tough rubber or plastic sheathed. An internal earth link has two terminals for through connection.

LOW-VOLTAGE ELECTRIC BLANKETS

The latest addition to the range of electric blankets manufactured by PIFCO, LTD., Pifco House, Watling Street, Manchester, 4, is a low-voltage model available in single and double bed sizes. It is made of soft, fleecy rayon/wool in pink or gold with matching satin ribbon binding and the respective sizes are 70 by 34in and 70 by 54in. A control unit for stepping down the mains voltage to 12 V has, additionally, an illuminated switch which enables three degrees of warmth to be selected. A feature of the double blanket is that by using two control units the degree of warmth of each half of the blanket can be selected independently. The price of the single blanket, complete with control unit, is £10 11s 8d and the double blanket, with two control units, is £20 2s. Both prices include purchase tax.

The "Windak" low-voltage blankets manufactured by WINDAK, LTD., Woodside, Poynton, Cheshire, are now produced with a new style pack and transformer. The blankets are bound with rayon satin and have corner tapes which tie to the mattress, thus keeping them smooth and unruffled. The prices, complete with transformer, and inclusive of purchase tax, are: single bed (71×33in) £13; double bed (71×52in) £16 16s; twin bed set (two blankets size 71×33in) £20 10s. The twin bed set has one transformer with two connections.

COMBINED HOME FREEZER AND REFRIGERATOR

The "Fresh and Freeze," a two-in-one home freezer and refrigerator, is the latest addition to the "Slimline" refrigerators manufactured by the ENGLISH ELECTRIC Co., LTD., English Electric House, Strand, London, W.C.2. The freezer compartment of this appliance is sufficiently large to accommodate up to 50 lb of frozen foods plus two large ice trays, while the normal refrigerator section provides over 4 cu ft of storage space plus additional space in its door. Two storage drawers and a 15 W interior light are provided.

Defrosting is carried out automatically and the water which collects in

English Electric "Fresh and Freeze" combined home freezer and refrigerator

the drain container can be emptied without disturbing the food in the refrigerator. The temperature for both compartments is regulated by one control which gives below zero temperature in the freezer and 40°F in the refrigerator, with warmer and colder settings. There is no "off" position as the appliance is intended to be continuously connected. Since the door of the freezer compartment is opened less frequently than the lower refrigerator, the frost build-up is low. As the frost grows it may be scraped away with a specially provided non-metallic spatula.

The "Fresh and Freeze" measures 49in by 21in wide by 23¼in deep and is finished in white or cream stoved enamel with a neat chromium trim between its two front opening doors. It is mounted on rollers at the rear with levelling screws at the front. The price is £80 17s 3d plus £16 15s 9d purchase tax and it will be available nationally from March, 1962.

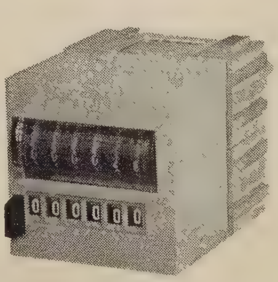
A.C.-D.C. TRANSFER STANDARDS

Vacuo-junction tubes in the form of thermal convertors which may be used as a.c.-d.c. transfer standards over a wide range of frequencies are announced by **Best Electrics, Ltd.**, Ranelagh House, Felixstowe, Suffolk. In these the junction of two dissimilar metals is placed in thermal contact with a heating filament, which carries the current to be measured. The structure is contained in an evacuated glass envelope to minimise heat losses. Since the thermal e.m.f. developed is proportional to the junction temperature, it is also proportional to the square of the heater current. By measuring the thermal e.m.f. on a suitable calibrated millivoltmeter, an indication is given of the applied current. If the instrument is calibrated on d.c., then the same calibrations will hold to within close limits on a.c. Further, since the vacuo-junction measures the *heating* effect of the applied current, indicated readings will be true r.m.s. values, regardless of waveform. Within the frequency range 25 c/s-20 kc/s, the vacuo-junction is accurate to within 0·01 per cent for all measurements.

Three patterns are available which between them permit accurate measurement over a frequency range extending from below 0·1 c/s to several hundred Mc/s. Each pattern is available with a variety of heater ratings, the most sensitive being rated at 1 mA maximum heater current.

INDICATING COUNTER

The Series P43 electromagnetic counter recently introduced by **Lancashire Dynamo Electronic Products, Ltd.**, Rugeley, Staffs., has facilities for predetermined batch operation combined with an indication of total count. The unit is designed to enable the operator to manually preset any batch from 999,999 downward and when the set number is reached an internal switch is actuated. Manual and electrical reset facilities are provided and the units are designed for counting speeds of up to 1,500 impulses per minute. Constructional techniques include plug-in facilities, interlocking dove-tailed castings for building up blocks of counters, and alternative flush panel and proud mounting arrangements. The counters are designed for a range of supply voltages from 6 to 220 V, suitable power supply units being included in the range of accessories which are available.



Lancashire Dynamo Electronic Products electromagnetic counter

HIGH STABILITY RESISTORS

The type N. resistor made by **Electrosil, Ltd.**, Colnbrook By-Pass, Colnbrook, Slough, Bucks., is constructed of metal oxide film on optical quality glass. Life testing of 1,500 resistors over a period of three and a half years at loadings up to 140 per cent of rated wattage showed resistance changes of less than 1 per cent. The resistor is designed to meet the requirements of specification DEF 5114 and advance type approval has already been granted to part of the range. A noise level of less than 0·015 μV/V is achieved.

BENCH POWER SUPPLY

An addition to the range of laboratory power supplies available from **Solartron Laboratory Instruments, Ltd.**, Cox Lane, Chessington, Surrey, is the AS 1165, a general-purpose bench-mounting unit providing h.t., heater and bias supplies to thermionic valve circuits. The unit provides two individually stabilised and electrically isolated h.t. supplies which may be used independently or in series. A low current output is derived from the second of these by a cathode follower. Three decade switches enable the first output voltage to be set in 1 V increments to any value between 0 and 500 V. This supply has a maximum current rating of 350 mA and a regulation of 0·025 per cent. The second output provides a fixed potential of between 200 V and 250 V, as preselected by an internal control. The maximum available output current is dependent upon the delivered voltage and varies linearly from 100 mA at 250 V to 75 mA at 200 V, with a regulation of 0·01 per cent. The ripple and noise component on all three supplies is approximately 1 mV pk-pk.

An overload cut-out, tripping at a nominal current of 420 mA, is provided on the first output, visual warning of operation being given by a panel-mounted indicator lamp. The OP1 and OP2+OP3 supplies are independently switched, and the load currents monitored on a dual-range meter. Two independent a.c. heater voltages of 6·3 V at 5 A each are provided, and may be operated in series or in parallel. The unit will operate from 100-125 V/200-250 V, 50-60 c/s, a.c. mains input and has a power consumption of approximately 575 VA at maximum output.

Solartron bench power supply unit

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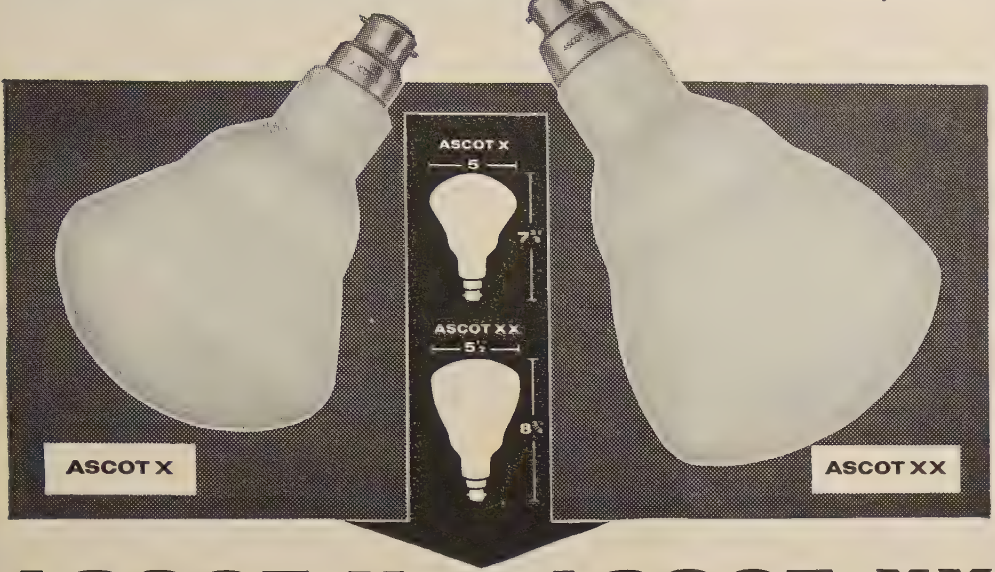

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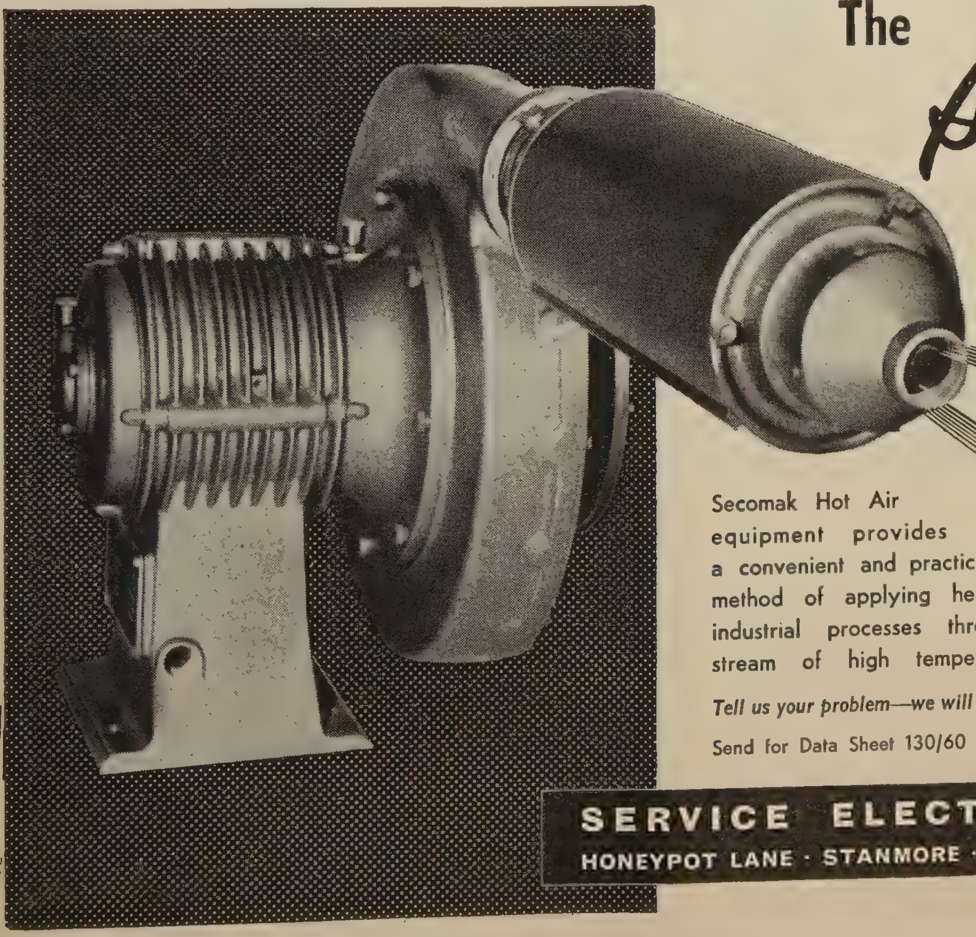

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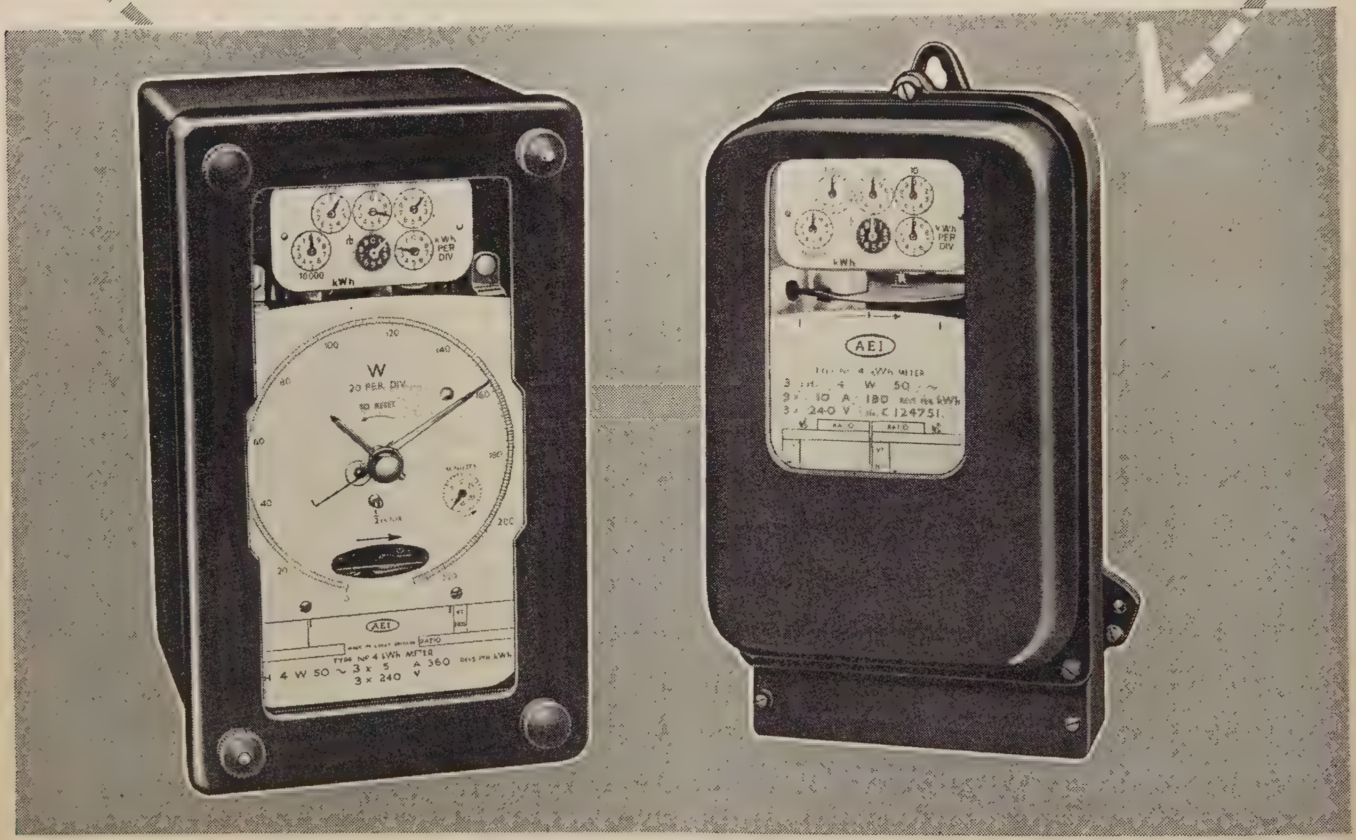

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ROYAL DAIRY SHOW

EXHIBITS at the Royal Dairy Show, organised by the Royal Association of British Dairy Farmers and held at Olympia, London, last week, covered a very wide field and almost every aspect of this very important side of farming was represented.

As in previous years, the British Electrical Development Association took the opportunity to demonstrate to dairy farmers the advantages which may be gained by using electrical methods—particular attention being paid to in-barn hay drying. Storage and batch (platform and tunnel) methods were shown in scaled-down installations with plenty of quality barn-dried hay in evidence. Associated with this were typical axial-flow and centrifugal fan units suitable for the various methods. Automatic milling, mixing and cubing of feeding stuffs on the farm was featured pictorially as a further means of reducing production costs of farm livestock produce. Visitors to the E.D.A. stand were also able to discuss individual crop-drying problems and advice was obtainable on almost all electro-agricultural techniques.

Several manufacturers exhibited refrigeration apparatus, including milk-cooling plants, cold rooms, deep freeze equipment, etc. Of particular interest to the dairy trade on Prestcold's stand was a display of " Super Presmetic " condensing units suitable for bulk milk collection tanks and refrigerated transport, as well as their orthodox use in cold rooms and display cases. Shown for the first time was the Prestcold " Mobar " spot merchandiser, an open-topped refrigerated display cabinet capable of holding nearly 1 cwt of frozen foods. Iced water milk coolers for surface and in-churn cooling were to be seen on Purlac Equipment's stand, some models having capacities of up to 250 gal per day. This company also showed a range of water heaters, egg coolers, brooders, greenhouse heaters, etc.

Other companies to show milk cooling plant and equipment included Loheat, Ltd., and Gascoignes (Reading), Ltd.

Ventilation equipment for pig and poultry houses was specially featured by the London Fan & Motor Co., Ltd. On view were the company's " Breeza " propeller fans and two types of roof units—fibreglass and sheet metal. Regulators and thermostats were also displayed.

George W. King, Ltd., had a fairly representative selection of dairy and farm equipment on view, amongst which were electrically-operated chain blocks, sack hoists, etc. Sliding door gear for barns and outbuildings was also to be seen. For the farmer who prefers to grind his own corn Christy & Norris, Ltd., displayed their 3 h.p. " Essex Major " hammer mill. Also shown, coupled to a 5 h.p. hammer mill, was the company's " Pressfeed " packaged plant. This plant comprises a 1 ton mixer, elevator, meal hopper, cubing and pelleting machine, cube cooling bin and control panel. Other exhibits included the " Pneugrister " combined hammer mill and oat crusher; the " Quick-Mix " mill and mash mixer; and the 15 h.p. " Briton " grinder.

A new 2 gal low-priced butter-making churn was seen on the stand of Brent (Hailsham), Ltd. The manufacturers claim that it will make, wash and salt butter, and it is designed for the small farm or domestic use. It is driven by an electric motor and the container is of stainless steel. The butter-making capacity is 4 lb per churning of 20 minutes.

For local dairy delivery work the electric vehicle is undoubtedly the most suitable method of transport and several manufacturers had models on view. Among these were Smith's Delivery Vehicles, Ltd.; the Harborough Construction Co., Ltd., who showed both driver-driven and pedestrian-controlled types; Stanley Engineering Co., Ltd.; and W. & E. Vehicles, Ltd. The last-named company exhibited an entirely new articulated five-wheeler with a turning circle of only 17ft 6in diameter for ease of operation in congested areas.

The D.P. Battery Co., Ltd., showed selections from their range of " Kathanode " traction cells and batteries, which are widely used throughout the dairy industry on electric vehicles for milk delivery.

OVERHEAD CONDUCTOR CURRENT RATINGS

IN the Electrical Research Association's Report Ref. O/T26 current ratings are presented for aluminium, aluminium alloy and steel-cored aluminium conductors for overhead power transmission purposes corresponding to new and revised British standards. The standards in question are B.S. 215 : 1956, Part 1; B.S. 3242 : 1960; and B.S. 215 : 1956, Part 2, respectively. For each conductor area, current ratings are given for a number of conductor temperature rises above ambient, for black or bright conductors, for conductors shielded from or exposed to the sun, and for still air or air with a velocity of 1 m.p.h. In addition, a digital computer programme is given, the use of which permits the direct calculation of the majority of the current ratings. The full title of the report is " Current-Carrying Capacity of Bare Aluminium, Aluminium Alloy and Steel-Cored Aluminium Conductors for Overhead Power Transmission. Third Report," by H. Goldenberg—Ref. O/T26. Copies are obtainable from the Association at Cleeve Road, Leatherhead, Surrey, price 5s.

Technical Training

THE rapid development of the technical training programme is illustrated by the Minister of Education's latest edition of List 182 (" List of Sandwich Courses and Block Release Courses "; H.M. Stationery Office, 6s). The new list gives particulars of the 374 sandwich courses and of the 138 block release courses now being offered at Colleges of Advanced Technology and Technical Colleges. Courses range from all branches of engineering and chemistry to the newer avenues of study such as electronics, rubber technology and business studies. About a third of the sandwich courses now available lead to the award of the Diploma in Technology or to a university degree, and a similar proportion to higher national diplomas.

IN THE COURTS

Kite Flying Accident

Judgment was given for the Southern Electricity Board in the High Court last week in an action brought by Mr. O. C. H. Moyle, of Barnes, Surrey, for alleged negligence and breach of statutory duty. In August, 1956, Mr. Moyle was making preparations to fly a kite at Hungerford, Berks. The kite, which had a long steel wire attached to it instead of the usual string, was placed on the ground while the wire was being paid out and the wind lifted it and blew it into the air. The kite descended on some 33 kV cables and Mr. Moyle was severely burned; as a result his right arm had to be amputated below the elbow.

Plaintiff's case was that the Electricity Board had failed to give any proper warning of the existence and danger of the overhead lines and had neglected to install a tripping device the effect of which would be to cut off the electricity in the event of a leakage to earth.

Mr. Justice Stevenson said that he had every sympathy with the plaintiff, who had suffered dreadful injuries and had done his best to rehabilitate himself in difficult circumstances. He had also given his evidence with great frankness. Nevertheless his Lordship could not say that the defendants were responsible for the accident. The plaintiff's own expert witness had said that the tripping device was as efficient a one as was known at the date of the accident, and there were notices marked "Danger" on the poles and barbed wire to prevent persons climbing them. The defendants were not to blame if the plaintiff did not see them.

The Board did not ask for costs.

C.E.G.B. Fined

The Central Electricity Generating Board was fined a total of £350 at Birmingham Magistrates' Court on 13th October on summonses arising out of two accidents, one of them fatal, at Nechells power station in April and July this year.

The Board was fined £250 for failing to make a switchboard dead before maintenance work was started, as a result of which there was an explosion when a workman came in contact with an 11 kV circuit and was fatally injured.

A fine of £100 was imposed for failing to protect a live conductor, as a result of which another workman received serious burns which kept him off work for 18 weeks.

In each case pleas of "Guilty" were entered on behalf of the Board by Mr. David Roberts, who said that steps had since been taken to ensure that the accident could not happen again. Nechells power station had always had a good safety record and last year had won the divisional trophy.

Mr. A. M. Young, prosecuting, said the explosion which led to Mr. Ernest Browning being killed occurred on 9th July. Engineers were to inspect a circuit-breaker in a switch-house at Nechells. The live circuit was isolated but unknown to them apparently there was another live circuit in the same cubicle but on a higher level. Mr. Browning had been instructed to clean the insulators, but the door to the cubicle did not say there were two circuits inside and one of them was still live.

Mr. Roberts, for the Board, said that the cubicle was the only one where there were two circuits and that fact was not known.

Dealing with the other summons, Mr. Young said a workman, Mr. Frederick Stacey, received serious burns when he came into contact with a live conductor in a cubicle in a substation at Nechells. Apparently he was reaching through a hole for a bottle of linseed oil when he came into contact with a conductor which should have been protected.

Glen Nevis Hydro-Electric Scheme

In the House of Commons last week Mr. MacArthur asked the Secretary of State for Scotland when an inquiry would be held into the amenity objections to the Glen Nevis Hydro-Electric Scheme.

Mr. Maclay said that at the time of the announcement of the appointment of the Mackenzie Committee it was intended that the economic and amenity issues raised by the Glen Nevis scheme should be dealt with concurrently but independently with a public inquiry into objections into the scheme being held while the committee was still sitting. On that assumption he anticipated that when both reports were available it would be possible properly to judge the scheme with fairness to all concerned.

"Subsequently, however," he continued, "certain of the objectors represented that their views on amenity could not be developed fully before they had had an opportunity to study the conclusions of the Mackenzie Committee and, having regard to the underlying principles of the Franks Report, I have concluded that the inquiry must be deferred until the Mackenzie Committee Report is available." He had discussed with the North of Scotland Hydro-Electric Board the implications of this decision on its generating programme and the Board had decided that the situation in 1965-66, the date by which the Nevis scheme might have come into full operation, could best be met by the bringing forward in its programme the 120 MW oil-fired steam set at Dundee which it had planned to provide later. An application for consent had been submitted to him.

So far as 1966-67 was concerned, it was essential that progress should be made now with the necessary preliminary work on other new schemes if the Board was to be in the position to meet its needs in that year by hydro-electric development. The Board proposed to proceed with this work and he had agreed that, if necessary, it should carry it to the stage of formal publication of its proposals for individual schemes. His agreement, however, was on the understanding that no order confirming a scheme would be presented to Parliament until the Mackenzie Committee Report was made available; this, he understood, would be about the middle of next year.

EUROPEAN HYDRO-ELECTRIC POTENTIAL

Although hydro-electric power accounts for nearly 40 per cent of Europe's electrical energy production, assessment of the Continent's total hydro-electric potential has been hindered by the lack of a common basis for the comparison of national studies of water resources.

This problem has been the subject of a study by the Economic Commission for Europe and one of the fundamental requirements was to define fixed upper limits to the hydro potential available in an average year, assuming that the physical resources of the different catchment areas were fully available for power production. General information on the mean annual distribution of this gross hydro-electric surface potential, as given by the characteristics of stream flow and elevation and expressed in kWh per year and per square metre, is now set out in map form in "The Geographical Distribution of Gross Surface Hydro-Electric Potential" (H.M. Stationery Office, 2s 6d).

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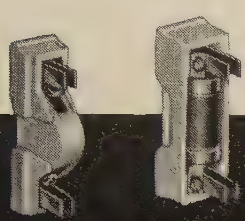
15, 30, 60, 100 AMPS
500 VOLTS

The 'Memrex Senior' range of switchgear is weatherproof and dustproof and is designed for use in factories, harbours, chemical plants, mills and like installations, where robust cast iron switchgear is required.

S.P. & N., D.P., T.P., T.P. & N.

Fuses are of "Kantark-Exel" pattern the bases of which will accept semi-enclosed rewireable or H.R.C. fuse carriers.



Semi-enclosed rewirable (damper type) patterns comply with B.S. 3036: 1958.

M.E.M.H.R.C. cartridge fuse carriers are designed to accommodate H.R.C. cartridge fuse-links made to B.S.88: 1952, Appendix 'J' Dimensions, Form A—Offset Tags.

Ample wiring space and a detachable switchbar greatly facilitate the speed of wiring.

All live metal is adequately shielded to avoid accidental contact when cover is open. The porcelain shields also serve as efficient arc barriers.

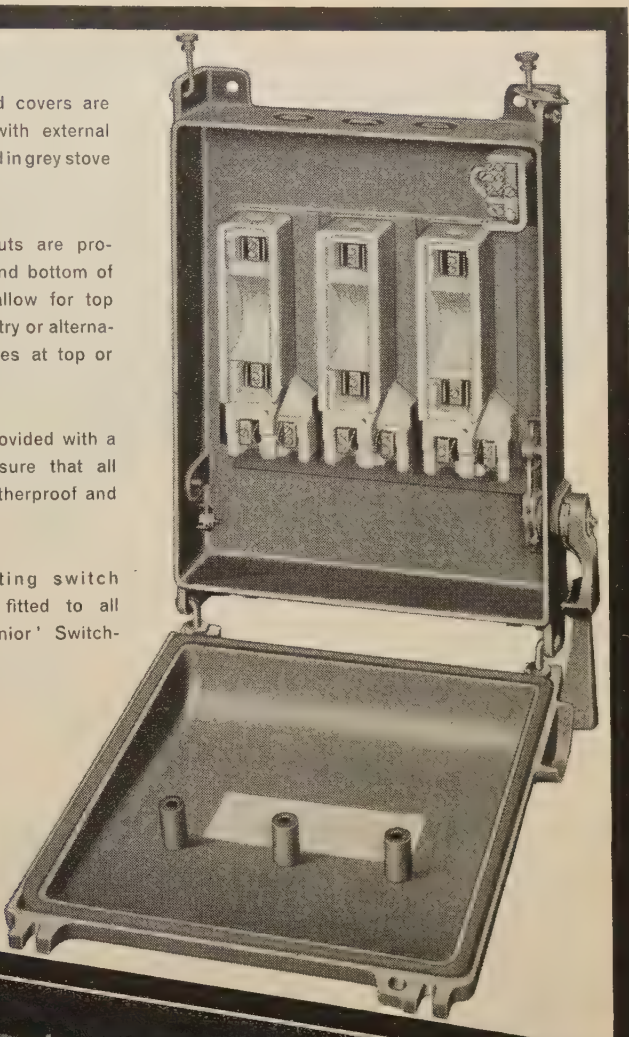
The range ensures compliance with the most strict interpretation of I.E.E. Regulations (13th Edition) and with the requirements of the Electricity (Factories Act) Special Regulations.

The cases and covers are of cast iron with external fixings, finished in grey stove enamel.

Three knockouts are provided at top and bottom of case, which allow for top and bottom entry or alternatively all entries at top or bottom.

Covers are provided with a gasket to ensure that all units are weatherproof and dustproof.

Side operating switch handles are fitted to all 'Memrex - Senior' Switchgear.



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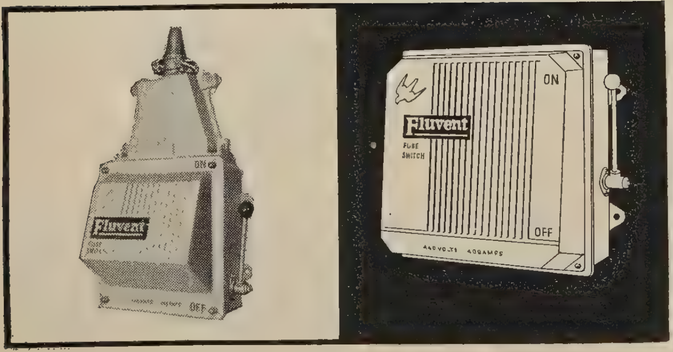
MIDLAND ELECTRIC MANUFACTURING CO. LTD., REDDINGS LANE, TYSELEY, BIRMINGHAM, 11



FLUVENT Falcon—a high quality fuse-switch of performance exceeding the requirements of BS 3185-1959. In 60, 100, 150, 300 and 400 amp sizes, each with full certification and all fitted with Aeroflex Fuses. These fuse-switches have been tested well beyond the BS requirements to exploit the time-lag and non-ageing characteristics of Aeroflex Fuses. However arduous the duties, Fluvent Falcon are always in control.

Making capacity 46 K.A.; fuse breaking capacity 46 K.A.; switch breaking capacity 5 to 7 times rated current at 0.3 power factor.

Write for List HD1 for full details.

AEROFLEX
Fluvent

HEAVY DUTY **FUSE-SWITCHES**

FOR VOLTAGES NOT EXCEEDING 600 VOLTS

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NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the " Electrical Review " clearing house, Room 243a, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

MONDAY, 6th NOVEMBER

Birmingham.—James Watt Memorial Institute, Great Charles Street, 6.30 p.m. I.E.E. South Midland Centre. " A Dynamic Model for Studying the Behaviour of Overhead Equipment Used in Electric Railway Traction," by D. S. Farr, H. C. Hall and Dr. A. L. Williams.

Bolton.—Railway Hotel, Trinity Street, 7.45 p.m. A.S.E.E. Bolton Branch. " Modern Electric Motors and Their Control," by J. B. Abbot.

Cardiff.—South Wales Institute of Engineers, Park Place, 7.30 p.m. A.S.E.E. South Wales Branch. " Silicones in the Electrical Industry," by J. Davies.

Chester.—Grosvenor Hotel, 6.30 for 7 p.m. I.E.E. Mersey and North Wales Centre. Annual dinner.

Halifax.—Griffin Hotel, George Street, 7.45 p.m. A.S.E.E. Halifax Branch. " The Activities of the E.I.B.A.", by J. R. Bardsley.

Ilford.—Angel Hotel, Ilford Broadway, 8.15 p.m. A.S.E.E. South Essex Branch. " The History of Electricity in the Royal Navy," by Capt. B. Bloomfield.

London.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Electronics and Communications Section. " The General Problems of F.M. Multi-Channel Communications," by R. G. Medhurst.

Manson House, 26, Portland Place, W.1, 7 p.m. Society of Instrument Technology, Control Section. " Semiconductor Diodes and Rectifiers in Control Engineering," by P. R. Wyman, and " The Transistor in Control Engineering," by Dr. G. D. Bergman.

Tudor Room, Caxton Hall, S.W.1, 6.30 p.m. Electrical Power Engineers' Association, London Technical Group. " Modern Power Plants and Operating Practices—Detroit Edison Co., U.S.A.", by J. R. Taylor.

Newcastle-upon-Tyne.—Rutherford College of Technology, Northumberland Road, 6.15 p.m. I.E.E. North Eastern Measurement and Electronics Group. " Microminiaturisation," by L. J. Ward.

TUESDAY, 7th NOVEMBER

Edinburgh.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South East Scotland Sub-Centre. " Brushless Variable-Speed Induction Motors using Phase-Shift Control," by Prof. F. C. Williams, Dr. E. R. Laithwaite, J. F. Eastham and W. Farrer.

Glasgow.—Royal College of Science and Technology, C.1, 7 p.m. Institute of Fuel, Scottish Section. " Water Treatment in Central Power Stations," by F. F. Ross.

Gloucester.—Royal Hotel, Station Road, 8 p.m. A.S.E.E. Gloucester and District Branch. " 11 kV Jointing and Boxes."

Leeds.—Leeds and County Conservative Club, South Parade, 6.30 p.m. I.E.E. North Midland Centre. " Some Technical and Economic Aspects of the Generation and Transmission of Reactive Power in the Supply System of England and Wales," by W. Casson and H. J. Sheppard.

London.—White Hart, 49, King's Road, Chelsea, S.W.3, 7.45 p.m. A.S.E.E. West London Branch. " Recent Developments in Discharge Lighting," by J. J. French.

Eltham Green School, Queenscroft Road, Eltham, S.E.9, 7.45 p.m. A.S.E.E. South East London Branch. " Earth Resistance and Earth Loop Testing," by J. V. Gomersall.

Royal Society of Arts, John Adam Street, Adelphi, W.C.2, 7 p.m. Institution of Plant Engineers. " Pilot-scale Research Work at the D.S.I.R. Warren Spring Laboratory," by S. H. Clarke.

Great George Street, Westminster, S.W.1, 5.30 p.m. Institution of Civil Engineers. Presidential address.

Maidstone.—Technical College, 7 p.m. I.E.E. Maidstone Branch. " The New I.E.S. Code." Joint meeting with the A.S.E.E. and Maidstone Technical College.

Manchester. — Electrical Engineering Laboratories, University, Dover Street, 6.15 p.m. I.E.E. North Western Centre, Utilisation Group. " Some Recent Developments in Oscillating Electrical Machines," by Prof. F. C. Williams.

Peterborough.—White Lion Hotel, Church Street, 7.30 p.m. Institution of Plant Engineers, Peterborough Branch. " Application of Modern Industrial Switch and Control Gear," by P. C. Belton.

Wolverhampton. — Wolverhampton and Staffordshire College of Technology, Wulfruna Street, 6.15 p.m. Association of Supervising Electrical Engineers. Haldane Regional Lecture. " Electrical Propulsion Devices in Space Flight," by Dr. L. R. Shepherd.

Workington.—College of Further Education, 7 p.m. I.E.E. North Eastern Centre. " Silicon Power Rectifiers," by A. J. Blundell, A. E. Garside, R. G. Hibberd and I. Williams.

TUESDAY 7th and WEDNESDAY, 8th NOVEMBER

London.—Connaught Rooms, W.C.2. B.E.A.M.A. Publicity Conference.

WEDNESDAY, 8th NOVEMBER

Bath.—S.W.E.B. Demonstration Theatre, 6 p.m. I.E.E. Western Utilisation Group. " Silicon Power Rectifiers," by A. J. Blundell, A. E. Garside, R. G. Hibberd and I. Williams.

Birmingham.—Engineering and Building Centre, Stephenson Place, 7.30 p.m. A.S.E.E. Birmingham Branch. " The Kariba Dam Project," by H. J. Beard.

Glasgow.—Institution of Engineers and Shipbuilders, 39, Elmbank Crescent, C.2, 6 p.m. I.E.E. South West Scotland Sub-Centre. " Education: Why Bother? " by Dr. K. R. Sturley.

Lancaster. — N.W.E.B. Demonstration Theatre, North Road, 7.30 p.m. I.E.E. North Lancashire Sub-Centre. " The Shielding of Overhead Lines against Lightning," by J. H. Gridley.

London.—School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1, 6 p.m. British Institution of Radio Engineers, Medical Electronics Group. " Electronics in Chromatography," by E. L. Gregory and E. A. Piper.

Luton.—College of Technology, Park Square, 8.15 p.m. A.S.E.E. Luton Branch. " Development of Oil-Fired Boiler Control Gear," by J. S. Smith.

Manchester.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North Western Centre, Electronics and Communications Group. " Data Transmission," by R. H. Franklin.

Café Royal, Peter Street, 6.30 for 7 p.m. I.E.S. Manchester Centre. Annual dinner.

Newport (Mon.).—King's Head Hotel, 6.30 p.m. Newport and District Electric Club. Ladies' evening.

Oxford.—Demonstration Room, Southern Electricity Board, 37, George Street, 7 p.m. I.E.E. Oxford District. " Unconventional Methods of Energy Conversion," by P. D. Dunn.

Preston.—Harris College, Corporation Street, 7.30 p.m. Institution of Production Engineers, North Western Region. " Spark Erosion," by P. J. C. Gough.

Salisbury.—S.E.B. Showrooms, 17, New Canal, 6.30 p.m. I.E.E. Southern Centre. " The Protection of High-Voltage Insulators from Power-Arc Damage," by Dr. A. E. Guile.

WEDNESDAY, 8th to FRIDAY, 10th NOVEMBER

London.—Savoy Place, W.C.2. I.E.E. Measurement and Control Section. Conference on " Non-Destructive Testing in Electrical Engineering."

THURSDAY, 9th NOVEMBER

Bradford.—Midland Hotel, 7.30 p.m. A.S.E.E. Bradford and District Branch. " The British Standard Motor," by J. L. Browell.

Dundee.—Electrical Engineering Department, Queen's College, 6 p.m. I.E.E. North Scotland Sub-Centre. " Thermistors—their Theory, Manufacture and Application," by Dr. R. W. A. Scarr and R. A. Setterington.

London.—1, Birdcage Walk, Westminster, S.W.1, 6 p.m. Institution of Mechanical Engineers, Automatic Control Group. Inaugural meeting. " Brains Trust " on Automatic Control.

John Adam Street, Adelphi, W.C.2, 5.15 p.m. Royal Society of Arts, Commonwealth Section. " New Developments in the Use of Solar Energy," by Dr. H. Heywood.

R.S.A. Lecture Hall, Adelphi, W.1, 7 p.m. Radar and Electronics Association. " Space Communications." Part 2: " Orbits and their Economics," by Dr. W. F. Hilton.

25, Foubert's Place, W.1, 11.30 a.m. Electrical Association for Women, London Branch. Lecture " Electrical Flash."

Manchester. — Demonstration Theatre, N.W.E.B., Town Hall Extension, 6 p.m. I.E.S. Manchester Centre. " Lighting for Christmas," by E. P. Lee.

Middlesbrough.—Cleveland Scientific and Technical Institution, 7.30 p.m. Society of Instrument Technology, Tees-Side Section. Symposium on Modern Instrument Maintenance.

Newcastle-upon-Tyne.—Plate Mill, Consett Iron Co., Ltd., 7 p.m. A.S.E.E. Newcastle-upon-Tyne and District Branch. Visit.

Roadway House, Oxford Street, 7 p.m. Institution of Plant Engineers, North East Branch. " Automatic Boiler Control for Medium and Small Size Boilers."

Salisbury.—Cathedral Hotel, 8 p.m. A.S.E.E. Southampton Branch. " Electricity in Agriculture," by D. W. Holley.

Swansea.—Electricity Board Showrooms, Kingsway, 6 p.m. I.E.E. West Wales (Swansea) Sub-Centre. " A Survey of Street Lighting and its Future," by W. R. Stevens and H. M. Ferguson.

Taunton.—Lecture Theatre, S.W.E.B., Electric House, The Parade, 3 p.m. I.E.E. South Western Sub-Centre. Third Hunter Memorial Lecture. " The Application of Electronics to the Electricity Supply Industry," by Dr. J. S. Forrest.

FRIDAY, 10th NOVEMBER

Birmingham.—Lecture Theatre, Byng Kendrick Suite, Gosta Green College of Technology, Aston Street, 6.30 for 7 p.m. Society of Instrument Technology, Midland Section. " Instruments in Clinical Chemistry," by N. Crawford; " Electronics in Surgery," by R. Lightwood.

Leeds.—The Mansion, Roundhay, 8 p.m. to 1 a.m. I.E.E. North Midland Graduate and Student Section. Annual dinner and dance.

London.—Grosvenor House, Park Lane, 7 p.m. to 2 a.m. Electrical Industries Ball.

Caxton Hall, Westminster, S.W.1, 6.30 p.m. Electrical Power Engineers' Association. " Demand Metering," by W. S. Barrett.

Connaught Rooms, W.C.2, 12 noon. National Inspection Council for Electrical Installation Contracting. Annual general meeting and luncheon.

Nottingham.—Welbeck Hotel. Institution of Plant Engineers, East Midlands Branch. Dinner and dance.

Saltburn.—Zetland Hotel, 7 for 7.30 p.m. I.E.E. Tees-Side Sub-Centre. Annual dinner and reunion.

SATURDAY, 11th NOVEMBER

London.—Horseshoe Hotel, Tottenham Court Road, 6 p.m. A.S.E.E. South Essex Branch. Annual dinner and dance.

Financial Section

STOCKS and SHARES

GILT-EDGED securities have remained the firmest market in the Stock Exchange. Further gains of up to 1½ points in the British Electricity issues during the week were representative of the extent to which prices responded to persistent buying in anticipation of another reduction in Bank Rate, and under a growing impression in some quarters that the still abnormally high yields on Government stocks may not be available for very much longer. Competition from the industrial market remained weak. Some of the company news has again been discouraging, with a notable exception, however, in the case of Crompton Parkinson.

Crompton Parkinson

The 8 per cent increase in profits reported by Crompton Parkinson for the year ended in June was regarded in the market as a notably good achievement in itself, and the more so when contrasted with some of the other results which have been published recently from those branches of the electrical industry in which the company is active. As expected, the dividend is maintained at a total of 12½ per cent, and although the year's net surplus is affected by a larger tax charge it covers the amount of the distribution some 2¼ times over. Satisfaction with these results was registered in a sharp improvement in the price of the 5s shares to 12s 3d. They yield a fraction over 5 per cent.

Mixed Changes

Industrial markets as a whole remained lifeless and inclined to the dull side, with the index of leading share prices now more than 20 per cent below the peaks recorded in May and 6 per cent under the level ruling at the beginning of the year. Leading shares in the electrical sections failed to sustain the previous week's better trend. Few losses were of much consequence, but there were larger setbacks in Hoover, E.M.I., Ultra Electric and Chloride Electrical. Tube Investments, however, recovered 2s 6d to 60s, in advance of the final dividend declaration. Dimplex continued to show a fine disregard of the surrounding conditions, and Aberdare Holdings advanced to 17s, their best price of the year, after details of coming issues had been published.

W. H. Sanders Capital

In announcing a "rights" issue of 250,000 new 2s shares at 11s each, the directors of W. H. Sanders (Electronics) said that demand for the products was growing larger than present capacity. Part of the proceeds from the issue, amounting to some £134,000, will consequently be needed to meet

Price Changes in

Company or Board	Nom. Value	Middle price 30th Oct.	Week's Rise or Fall	Dividend		Yield %			1961	
				Previous	Last	£	s	d	Highest	Lowest
Gilt-edged Stocks										
Brit. Elec. 1968/73	100	75½	+1½	3	3	3	19	6	75½	70½
Brit. Elec. 1974/77	100	69½	+1½	3	3	4	6	3	70½	64½
Brit. Elec. 1976/79	100	70½	+1½	3½	3½	4	19	3	73½	67
Brit. Elec. 1974/79	100	79	+1½	4¼	4¼	5	7	6	82	75
Brit. Elec. 1967/69	100	91½	+1	4½	4½	4	18	3	91½	86
Overseas Electric Supply										
Calcutta Elec.	£1	21/3		7†	7½†	11	11	0	22/3	20/6
East African Power	£1	13/-		8	10	15	7	9	15/-	13/-
Nigerian Elec.	£1	19/-		10	14	14	14	9	19/9	15/6
Perak Hydro-Elec.	£1	20/6		15	15	14	12	9	23/6	17/6
Electrical Shares										
Aberdare Holdings	5/-	17/-	+9d	17½	17½	—			17/-	14/3
Aerialite	1/-	4/3		54	40	9	8	3	8/-	4/3
Allen, W. H.	£1	26/-		14	10*	7	13	9	42/6	26/-
Allied Insulators	5/-	8/-	−6d	20	10*	6	5	0	10/-	8/-
Alwyn Holdings	5/-	21/-		12½	15‡*	3	11	6	22/3	16/6
Anglo-Portuguese Tel.	£1	19/9		9	9	9	2	3	25/-	18/9
Arcolectric	1/-	4/6		15	15	3	6	9	6/-	3/9
Aron Meters	5/-	26/3	−9d	15	15	—			30/-	17/-
Assoc. Elec. Ind.	£1	30/3		15	15	9	18	3	48/6	28/9
Babcock & Wilcox	£1	21/9	+3d	9	9	—			36/6	19/-
Bakelite	10/-	46/3		17½	17½*	3	15	9	60/-	42/-
Baldwin, H. J.	2/-	1/-		10	Nil	—			1/9	1/-
Berry's Electric	5/-	56/6		30	33⅓*	2	18	9	57/6	37/-
Bowthorpe Holdings	2/-	7/9	−3d	18½	22	5	13	6	10/3	7/9
Brit. Elec. Resistance	2/-	6/9		17½	17½*	5	3	9	8/9	6/6
Brit. Elec. Traction:										
Def. Ord. "A"	5/-	48/9	−3d	40	50	5	2	6	57/6	41/9
British Electronic Ind.	5/-	10/3	−6d	—	15	7	6	3	15/3	8/9
B.I. Callender's	£1	55/6		13½	13½	4	17	0	62/3	49/6
B.I. Callender's 6% Pref.	£1	16/6		6	6	7	5	6	18/3	16/6
British Thermostat	5/-	30/9		20	27½	4	9	6	40/-	28/-
Brook Motors	10/-	51/3		25	25*	4	17	6	55/-	47/-
Bruce Peebles	10/-	15/6		10	Nil	—			21/-	13/3
Bulgin, A. F.	1/-	12/3		55	40*	3	5	3	13/3	7/9
Bulpitts	5/-	16/9		15	16¼	4	17	0	27/6	16/9
Burco Dean	5/-	6/6	−3d	18	15	11	11	0	11/9	6/3
Cable & Wireless	5/-	17/3		10	10*‡	2	18	0	19/9	12/6
Cambridge Instruments	5/-	31/-		12½†	22	3	11	0	38/6	30/-
Chloride El. Storage "A"	£1	72/6	−2/6	17½	20	5	10	3	91/-	72/-
Clarke Chapman	£1	40/-		13¾	13¾	6	17	6	54/-	37/6
Clarke, T.	2/-	4/-		16	16	5	6	9*	5/3	3/6
Combined Elec. Mfrs.	4/-	7/-		—	12½	7	2	9	10/-	6/9
Contactor Switchgear	5/-	13/3	+3d	14	14	5	5	9	16/-	12/6
Crabtree	10/-	23/-	−6d	20	12½*	5	8	9	33/9	23/-
Crompton Parkinson	5/-	12/3	+9d	12½	12½	5	2	0	14/6	11/3
De La Rue	10/-	44/6	−2/6	22½	22½*	5	1	0	70/-	44/6
Decca "A"	10/-	56/-	+6d	23⅓	23⅓	4	3	0	70/-	52/3
Desoutter	5/-	55/-		30	35	3	3	9	68/9	49/-
Dewhurst	2/-	5/3	−3d	20	20	3	16	3*	6/6	3/9
Dictograph Tel.	2/-	10/6		20	20*	3	16	3	13/-	8/6
Dimplex	5/-	53/6	+1/6	30	35*	2	0	3*	54/-	28/3
Dubilier Condenser	1/-	2/-		30	15*	7	10	0	3/-	2/-
Duport	5/-	10/3	−3d	17½	20	6	10	0*	17/-	10/3
E.M.I.	10/-	35/6	−1/6	17½	17½	4	18	6	51/3	35/3
Eleco	2/-	8/6	+3d	20	20*‡	4	14	3	10/6	4/3
Electrical Apparatus	5/-	20/-		20	22	5	10	0	21/-	17/-
Electrical Components	5/-	8/6	−6d	11½	12½	7	7	0	9/9	7/9
Elec. Construction	£1	20/-	−1/-	9	5	5	0	0	39/-	20/-
Elliott-Automation	5/-	34/-	−1/-	9·3	13	1	18	3	37/6	25/6
Enfield Rolling Mills	£1	38/-	+6d	15	15	7	18	0	51/6	37/6

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

the anticipated cost of acquiring more factory accommodation for which negotiations are in progress. Full benefits from increased production are not expected to appear until 1962–63, but for the current year the level of profits is expected at least to be maintained, and the dividend on the increased capital should be not less than the present rate of 17½ per cent. Dealings in the new shares began at a premium of 5s 9d on the issue price. The all-in price of 16s 9d is more than 20s below the top quotations which were recorded for the old shares at the beginning of this year, but the minimum prospective yield is still under 2¼ per cent.

Electrical Investments

Company or Board	Nom. Value	Middle price 30th Oct.	Week's Rise or Fall	Dividend		Yield %	1961	
				Previous	Last		Highest	Lowest
Electrical Shares—continued						£ s d		
English Electric	£1	27/6	−1/3	10	10	7 5 6	40/9	26/3
English Electric 3¾% Pref. ...	£1	10/6	+3d	3¾	3¾	7 13 9	11/9	9/9
Ever Ready	5/-	38/-	+1/-	20	22½	2 18 0	40/-	31/6
Falk Stadelmann	£1	21/9		10	7½	6 18 0	26/-	21/9
G.E.C.	£1	24/9	−6d	10	10	8 1 6	39/6	24/3
G.E.C. 6½% Pref.	£1	16/6		6½	6½	7 17 6	19/3	16/6
General Cables	5/-	4/9		15	Nil	—	6/3	4/9
G.H.P. Group	£1	19/6		6	7‡	7 0 0	24/6	17/-
Goblin (B.V.C.)	5/-	4/6		12½	10	11 2 0	8/6	4/3
Hackbridge Holdings	5/-	5/3		20	10*	9 10 6	6/9	5/-
Harland Engineering	5/-	12/6	+6d	16	16	6 8 0	19/-	12/-
Head Wrightson	5/-	20/-	−1/-	14	16	4 0 0	30/-	20/-
Heatrae	2/-	16/-	+6d	12½	25	3 2 6	19/-	12/6
Holophane	5/-	16/9		30	30	8 19 0	20/6	14/6
Hoover	5/-	49/6	−1/9	90	45*	4 11 0	55/6	37/6
Hunt, A. H.	4/-	17/6		20	20	4 11 6	25/9	17/6
Intl. Combustion	5/-	22/9	−3d	20	30	6 11 9	33/9	22/9
Intl. Computers & T.	£1	90/-		10	11¼	2 10 0	107/-	59/-
Johnson & Phillips	£1	19/3	−9d	Nil	5	5 4 0	24/-	17/6
Kenwood Mfg.	1/-	3/3		—	—	—	6/-	3/3
Laurence Scott	5/-	14/3		15	15	5 5 3	18/9	14/3
Lister, R. A.	£1	51/-	+1/6	14	14	5 9 9	56/9	45/6
Lucas, J.	£1	50/-		12½	13¾	5 10 0	71/6	50/-
Marryat & Scott	2/-	16/9		27½	32½	3 17 6	18/6	13/9
Mather & Platt	£1	36/-		11	11	6 2 3	51/6	36/-
Metal Industries	£1	46/3	−9d	15	15	6 9 9	66/6	46/3
Midland Elec. Mfg.	£1	52/6	−1/3	12	12	4 11 6	67/6	52/6
Murex	£1	37/6		20	13*	6 18 3	51/6	37/6
Newman Ind.	2/-	7/-		12½	15	4 5 9	7/6	5/-
Oldham & Son	1/-	2/6	−3d	17½	17½*	7 0 0	3/-	2/3
Parmiter, Hope & S.	1/-	2/-		12½	20	10 0 0	2/5	1/6
Parsons, C. A.	£1	48/9	−9d	9⅜	12½	5 2 6	72/6	46/9
Philips' Lamps	Fl.10	220/-	+5/-	16	16*	1 9 0	£13¼	£9¾
Plessey	10/-	39/-	−1/-	17	15*‡	3 17 0	45/-	35/3
Pullin Group	2/-	10/-		25	25	5 0 0	15/-	10/-
Pyrotenax	5/-	41/3		40	45	4 2 0*	48/9	34/9
Radiation	£1	22/6	−6d	12	10	8 17 9	37/6	22/6
Reliance-Clifton	5/-	18/3		15	20	3 13 0*	22/-	14/9
Reyrolle	£1	38/3	−9d	17½	9¾*	5 2 0	51/6	36/6
Richardsons Westgarth	10/-	4/-	−3d	8⅛	Nil	—	8/3	4/-
Sanders, W. H.	2/-	16/6x.r.	+1/9	17½	17½‡	2 2 6	28/3	14/-
Sangamo Weston	10/-	20/9		13⅛	10‡*	4 16 6	25/9	18/9
Scott, James	5/-	30/-		25	27½	4 11 9	32/-	25/6
Simon Engineering	5/-	32/6	−2/3	—	27½	4 4 6	43/9	28/-
Smith (England), S.	4/-	13/9		17½	20	5 16 3	23/9	13/9
Southern Areas	£1	17/-		5	6	7 1 3	23/-	14/6
Strand Elec.	5/-	16/3	−9d	14·6	20	6 3 0	20/-	12/3
Sturtevant	5/-	9/3		15†	13†	11 9 0	18/6	9/-
Sun Elec.	5/-	14/3		15	18½	6 9 6	17/6	14/3
T.C.C.	10/-	41/3		35	22½*	5 9 0	43/9	40/-
Telephone Rentals	5/-	26/-	−3d	15	15‡*	2 17 3	29/6	18/6
Thompson (John)	5/-	12/9	−3d	20	5	—	16/9	12/9
Thorn Elec.	5/-	56/3	−1/3	25	25	2 4 6	63/-	44/6
Thornycroft	4/-	5/3	+3d	6	—	—	7/-	5/-
Tube Investments...	£1	60/-	+2/6	—	14	4 13 3	85/-	55/-
Ultra Electric	5/-	17/6	−1/6	20	25	—	31/3	12/6
Walsall Conduits	4/-	9/9	−3d	15	15	6 3 0	15/-	9/9
Ward & Goldstone	5/-	27/-	−1/-	35	17½*	3 4 9	36/6	25/6
Watford	2/-	6/6		25	20*	6 3 0	10/9	6/6
Westinghouse	£1	24/6	−1/3	11	11	8 19 6	45/-	24/6
West, Allen	5/-	10/3	−3d	12½	13½	6 11 9	14/6	10/3
Wilkins & Mitchell	5/-	8/9		21	12	6 17 3	15/3	8/9
Wolf Electric	5/-	12/9		12½	13¾	5 7 9	17/6	12/9

Plessey Merger

Plessey's merger offers to holders of Ericsson Telephones and Automatic Telephone shares not already owned by the company have been accepted to the extent of over 90 per cent of the ordinary capital in each case and have now been declared unconditional. Acceptances will still be received until further notice. Dealings in the new Plessey 10s shares issued in exchange for those of the two telephone companies began on Monday of this week at prices around 39s 6d. They are temporarily transferable free of stamp duty (which make them a slightly cheaper purchase than the old issue at 39s) and offer a yield of about 3¾ per cent on the 15 per cent rate of dividend forecast for the year now running.

Convertible Loan Stock

Part of the consideration offered by Plessey for the shares of Automatic Telephone was in the form of a 5 per cent convertible unsecured loan stock, redeemable between 1971 and 1974, but previously convertible—at the holder's option—into Plessey's ordinary shares in the ratio of 40 for every £90 of loan stock. This right may be exercised in the years 1962 to 1965 inclusive. In early dealings the new loan stock changed hands at around 100, at which level a buyer acquires in effect a four-year option on the company's ordinary shares at a price equivalent to 45s, as compared with their current market value of 39s. Combining a well secured fixed yield of 5 per cent with an interest in the future of a popular equity, this £9½ million issue helps to meet the demand for a form of investment which has been shown to make a considerable appeal in view of the uncertain circumstances prevailing today.

British Electric Resistance

With profits up by about 9 per cent in the year ended last July, British Electric Resistance are able comfortably to maintain the dividend at a total of 17½ per cent, the same rate as before but applicable to capital increased by a 25 per cent scrip issue. This gives shareholders their third increase in successive years, and they are promised another scrip issue, in the ratio of one for ten. There was little subsequent change in the price of the 2s shares which are quoted at 6s 9d to yield 5¼ per cent.

REPORTS and DIVIDENDS

W. H. Sanders (Electronics), Ltd., are raising £134,000 net more permanent capital by an offer to ordinary shareholders of 250,000 2s ordinary shares on the basis of one at 11s for every four ordinary shares held on 16th October. The new shares will not rank for the 17½ per cent dividend recommended for the year ended 30th June, 1961. For the year to June, 1962, the dividend is expected to be at least 17½ per cent on the increased capital.

Net proceeds will be used to reduce, by £50,000, the company's overdraft, to provide additional working capital and to meet the anticipated cost of acquiring more factory accommodation for which negotiations are in progress. The growing demand for the products of the group, it is stated, is in excess of present capacity, and the provision of more space will enable production to be increased.

Firth Cleveland, Ltd., has declared an unchanged 12 per cent interim on larger capital for the year 1961. Mr. Charles Hayward, chairman, giving his reasons for selling the controlling interest in the Solartron Electronic Group to Schlumberger, of Houston, Texas, said that "English companies in electronics should link with American companies." He declared that the American Government and American companies were spending "unbelievable sums" on the development of electronics. "An English firm which spends £1 million on research over four or five years will find itself made out of date by an American company spending £10 million or £15 million and employing a bigger research staff," stated Mr. Hayward. "Schlumberger is a very big company with tremendous funds," he said. "It was apparent that they could do more for the company than we could. They employ 1,500 research workers and there will be cross-fertilisation of ideas with the Solartron team."

Crompton Parkinson, Ltd.—Group trading surplus expanded from £2,509,000 to £2,722,000 in the year to 30th June, 1961. The dividend is maintained at 12½ per cent with an unchanged final of 7½ per cent. After crediting investment income and deducting an increased tax charge of £1,654,000, against £1,474,000, the group net income is up from £1,261,000 to £1,306,000.

British Electric Resistance, Ltd.—A final dividend of 12½ per cent maintains the total at 17½ per cent, as forecast, on capital increased by a one-for-four scrip issue. Net profit for the year to 31st July, 1961, is £41,120, compared with £38,779.

A further scrip issue, on a one-for-ten basis this time, is proposed for holders of the existing £225,000 capital.

Elliott-Automation, Ltd., announce the issue of an additional £1·5 million of 6½ per cent debenture stock, 1981/86.

Laurence, Scott & Electromotors, Ltd.—Interim dividend 3d per share (the same).

Allen West & Co., Ltd.—Unchanged interim dividend of 5 per cent on increased capital.

Automatic Telephone & Electric Co., Ltd.—Special interim dividend of 8 per cent as forecast under merger terms.

Ericsson Telephones, Ltd. — Tax-free interim dividend of 6½ per cent as forecast.

Simms Motors & Electronics Corporation, Ltd.—Interim dividend of 5 per cent, against an equivalent of 4·5 per cent.

New Companies

Lamp Metals, Ltd.—Registered 19th October. Capital £750,000. To acquire part of the undertakings of A.E.I. Lamp & Lighting Co., Ltd., and of the General Electric Co., Ltd., to carry on the business of manufacturers of and dealers in metal and metal alloys and articles made therefrom; electrical, mechanical, chemical, heating, electronic and nuclear engineers, producers of electrical, thermal, nuclear and other forms of power and light, etc. Secretary and solicitor: D. M. Vickers. Regd. office: Magnet House, Kingsway, W.C.2.

W. Greenwood Electronic, Ltd.—Registered 13th October. Capital £100. Manufacturers of and dealers in electrical and electronic instruments, etc. Directors: W. J. Greenwood and Agnes Greenwood. Secretary: Frances Ullman. Regd. office: 677, Finchley Road, N.W.2.

Thermotex, Ltd.—Registered 20th October. Capital £100. Manufacturers and distributors of flexible electrical heating pads, etc. Directors: D. L. Langrish-Smith and G. T. Harris. Secretary: S. H. Eastoe. Regd. office: 103, Cannon Street, E.C.4.

Bull Electrical Services (Westminster), Ltd.—Registered 20th October. Capital £100. Wholesalers, retailers, distributors, manufacturers of and dealers in apparatus and products connected with heating, lighting, etc. Solicitors: Booth & Blackwell, 3 & 4, Berners Street, W.1.

R. Van-Haaren, Ltd.—Registered 20th October. Capital £500. Manufacturers of and dealers in radio, electrical and mechanical apparatus of all kinds, etc. Directors: R. Van-Haaren (secretary), and June R. Van-Haaren. Regd. office: 216, Chingford Road, E.17.

Instrument Drives, Ltd.—Registered 20th October. Capital £500. Electrical engineers, etc. Directors: K. Tasker and J. E. F. Tulett (secretary). Regd. office: 68, Lisbon Avenue, Twickenham, Middx.

Dickinson & Parker, Ltd.—Registered 19th October. Capital £100. Electrical consultants, electrical engineers, etc. Regd. office: 35, Friern Barnet Road, N.11.

E.R.F. Cables, Ltd.—Registered 23rd October. Capital £5,000. Manufacturers of and dealers in electrical cables, etc. Directors: R. Lowe and W. J. Combellack. Secretary: E. B. Bennetts. Regd. office: 4, Castle Boulevard, Nottingham.

Fletco Lifts, Ltd.—Registered 23rd October. Capital £3,000. Electrical and mechanical engineers, etc. Directors: J. H. Fletcher (secretary), J. H. Cooke and W. J. Fletcher. Regd. office: 4/6, Cheapside, Liverpool.

Electrical Surveys, Ltd.—Registered 23rd October. Capital £100. Surveyors and reporters of and manufacturers of and dealers in dynamos, etc. Directors: T. W. Adams and Elizabeth W. M. Adams (secretary). Regd. office: 20, Great Chapel Street, W.1.

R. E. Parrott & Co., Ltd.—Registered 18th October. Capital £2,000. To design, develop, manufacture and distribute electronic and electromagnetic mechanisms and devices, etc. Directors: R. E. Parrott and Anne M. Parrott (secretary). Regd. office: 7, Kings Road, Trading Estate, Newbury, Berks.

Liquidations

Winding-up proceedings or liquidations are often undertaken for the purpose of reconstruction, the transfer of a business, or other reasons. The appearance of a company's name under this heading therefore does not necessarily indicate insolvency.

Aldens of Exeter, Ltd., radio and electrical engineers, 2, Teign Street, Teignmouth, Devon.—Winding up voluntarily. Liquidator, Mr. J. W. Fisher, Richmond House, Fore Street, Teignmouth, appointed by creditors on 5th October.

Warden Electrics, Ltd., 130, Monument Road, Ladywood, Birmingham, 16, electrical appliance retailers.—Meetings of creditors and contributories 7th November, at the Official Receiver's Office, Somerset House, 37, Temple Street, Birmingham, 2.

Norman H. Field, Ltd., radio, television and electrical goods retailers, 68, Hurst Street, Birmingham, 5.—Liquidator, Mr. W. L. Hand, Colmore House, 21, Waterloo Street, Birmingham, 2, appointed by members and creditors on 18th October. Particulars of claims to the liquidator by 30th November.

Electric House (F.G.H.), Ltd., retailers of electrical appliances, 929, Rochdale Road, Harpurhey, Manchester, 9.—Winding up voluntarily. Liquidator, Mr. L. H. Shipton, 31, Lloyd Street, Manchester, 2, appointed by members and creditors on 19th October.

Winding-up Order

G. & T. Electrics, Ltd., 246/8, Plumstead High Street, S.E.18.—Winding-up order made 16th October.

Bankruptcies

I. M. Swallow, electrical contractor, carrying on business at 19, Blyth Hey, Litherland, Liverpool, 21, under the style of Electrical Repairs & Trading Co.—Receiving order made 16th October on a creditor's petition.

J. A. Parker, electrical appliance dealer, carrying on business at 240, Chillingham Road, Heaton, Newcastle-upon-Tyne, and lately at 42, Huddlestone Street, Cullercoats, Northumberland, under the style of Household Refrigeration, and formerly carrying on business at 23, St. Mary's Street, Cardiff, as Cardiff Vacuum Cleaner Co.—Trustee, Mr. E. Taylor, 30-32, Grey Street, Newcastle-upon-Tyne, appointed 19th October.

A. Rose, residing and carrying on business as an electrical contractor at 18, Roseberry Road, Norton, Stockton-on-Tees, and lately carrying on business as an electrical appliance dealer at 31, Dovecot Street, Stockton-on-Tees.—Trustee, Mr. W. Dent, 13, Albert Road, Middlesbrough, appointed 11th October.

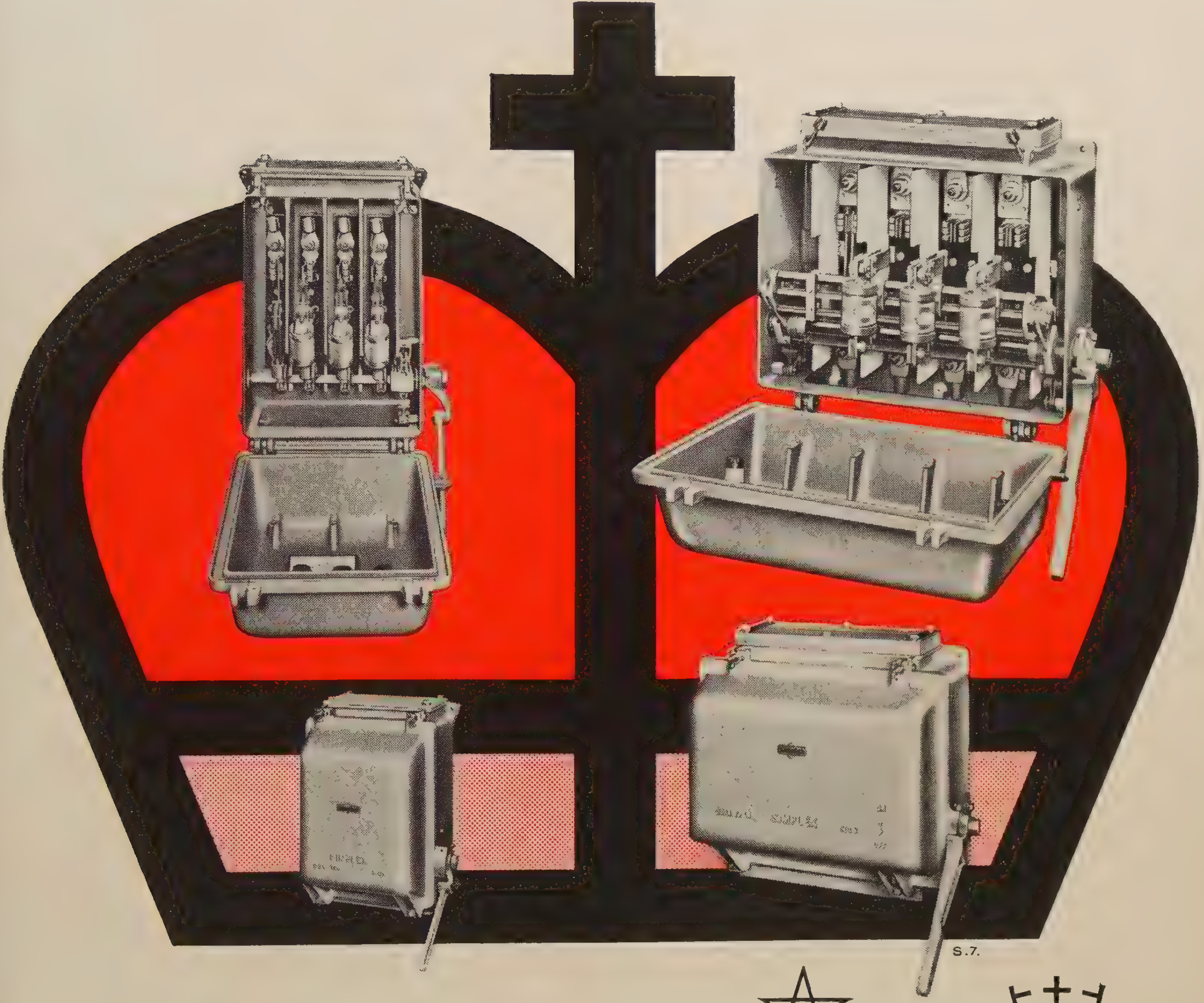
SIMPLEX MONARCH SWITCHGEAR-THE HEAVY DUTY RANGE IN THE SIMPLEX RANGE OF SWITCHGEAR

The robust, all-cast Monarch range of switches and fuse switches is primarily designed for heavy duty industrial work.

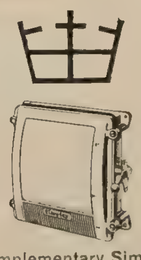
The casing is of weatherproof cast iron construction. The operating handle is interlocked with the cover. Provision for locking the cover or handle is also provided as standard, and handles can be supplied arranged for Castell interlocks.

Adaptor troughs are available for mounting on trunking and busbar chambers, and sealing chambers and glands for Monarch units are made to fit any type and size of normally used cable, either straight or reverse entry without drilling.

Monarch fuse switches 150, 300 amp. 500 volt.



Complementary Simplex Star range. Economically priced, front operated switchfuses in 15, 30, 60 amp. 500 volt. Busbar chambers 200, 400, 600 and 800 amp ratings. 600 volt. Distribution fuseboards 15, 30, 60 amp. 500 volt.



Complementary Simplex Regent range. Robust, stylish switchfuses, 15, 30, 60 and 100 amp. 500/600 volt. Busbar chambers 350, 550, 800 amp. 600 volt. Distribution fuseboards 15, 30 amp. 500 volt.

Simplex

ELECTRICAL DIVISION

SIMPLEX ELECTRIC COMPANY LIMITED
CREDA WORKS BLYTHE BRIDGE STOKE-ON-TRENT STAFFS
Branches throughout Great Britain and Agents throughout the World

HOW TO SOLVE YOUR WIRE AND CABLE PROBLEMS

WIRE and CABLE Casebook

1st Quarter, 1960

NEOPRENE a quarter century of service in the wire and cable industry

Earliest records of neoprene's use as a cable-jacketing material go back as far as 1933. Since then, this Du Pont synthetic rubber has more than proven itself in electrical installations throughout the world.

PROPERTIES AND APPLICATIONS OF NEOPRENE

Neoprene jacketing for electrical cable has gained wide acceptance primarily because of its durability. Manufacturers and users alike

... aerial cables, building ... all with jackets of Du Pont neoprene. But what about neoprene's insulation value? Electrical properties of neoprene (Figure 1.), while inferior to most commonly used insulating materials, have been proven more than satis-

UNDERGROUND CABLES are protected from galvanic cell action and acid corrosion with protective jackets of neoprene over their lead sheaths.

GET THIS NEW FREE QUARTERLY CASEBOOK ON MULTI-PURPOSE DU PONT NEOPRENE JACKETING

IMPORTANT NEW APPLICATIONS

This new series of *Wire and Cable Casebooks* will keep you up-to-date on all the latest uses of Du Pont neoprene — in switches, connectors, accessories and the many other products being developed for today's rapidly growing electrical industry.

All engineers — civil, electrical and industrial — will find this series of booklets a valuable source of information. The *Wire and Cable Casebook* documents neoprene's quarter century of service in the electrical industry. Du Pont neoprene is the elastomer that combats weather, sunlight, ageing, flame, ozone, corona, heat, oil and grease, as well as mechanical wear. Detailed reports of successful long-term applications — both overhead and underground — show you why industry has placed such confidence in Du Pont neoprene jacketing.

SEND IN YOUR NAME AND ADDRESS AND GET THE QUARTERLY CASEBOOK—FREE!

Du Pont will send you a free copy of *Wire and Cable Casebook* every quarter. Take advantage of this easy way to keep yourself well-informed about Du Pont neoprene and the other Du Pont elastomers. Fill in the coupon below and post today.

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. . . THROUGH CHEMISTRY

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NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1958

1323. Babcock & Wilcox, Ltd.—Power plant. 14th January, 1959. (879260.)

1602. Maschinenfabrik Oerlikon.—Circuit arrangement for protecting grid-controlled mercury arc rectifiers in case of short circuits. 16th January, 1958. (879541.)

1901. International Register Co.—Switch mechanisms. 20th January, 1958. (879466.)

2183. Siemens-Schuckertwerke A.G.—Production of semiconductor devices. 22nd January, 1958. (879656.)

2673. G-V Controls, Inc.—Electro thermal relay. 27th January, 1958. (879796.)

3963. I-T-E Circuit Breaker Co.—Current protective devices. 6th February, 1958. (879375.)

4495. English Electric Co., Ltd.—Brush gear assemblies for dynamo-electric machines. 5th February, 1959. (879469.)

4619. Electrolux, Ltd.—Vacuum cleaners. 12th February, 1958. (879543.)

5956. Yardney International Corporation.—Electric cell. 24th February, 1958. (879509.)

7250. Philips Electrical Industries, Ltd.—Electric control elements. 6th March, 1958. (879949.)

7877. Shockley Transistor Corporation.—Semiconductor devices. 11th March, 1958. (879977.)

8368. Automatic Telephone & Electric Co., Ltd.—Potential comparison circuits. 15th March, 1958. (879775.)

12611. British Oxygen Co., Ltd.—Electric arc welding. 21st April, 1959. (879658.)

14084. Philips Electrical Industries, Ltd.—Low-frequency amplifiers. 2nd May, 1958. (879661.)

14275. General Electric Co., Ltd.—Nuclear reactors. 28th April, 1959. (879902.)

14907. General Electric Co., Ltd.—Nuclear fuel element arrangements. 28th April, 1959. (879903.) 15155. Supporting arrangements for nuclear reactor fuel elements. 28th April, 1959. (879904.)

17089. Ditedis Diffusion-Technique-Distribution.—Electric hair dryers. 28th May, 1958. (879782.)

17406. Associated Electrical Industries, Ltd.—Printed circuits. 27th May, 1959. (879395.)

18144. Philips Electrical Industries, Ltd.—Magnetic storage circuit arrangements. 6th June, 1958. (879952.)

18676. Philips Electrical Industries, Ltd.—Transistor circuits. 11th June, 1958. (879651.)

19780. Chloride Batteries, Ltd.—Positive plates of lead-acid type electric accumulators. 12th June, 1959. (879399.)

20675. General Electric Co., Ltd.—Control means for electric switches. 19th May, 1959. (879511.) 20676. Liquid break electric switches. 19th May, 1959. (879512.) 20678. Isolators for electric switches. 19th May, 1959. (879514.) 20679. Electric switches having interlocking mechanisms. 19th May, 1959. (879515.) 23739. Electric switches provided with indicating instruments. 19th May, 1959. (879516.)

23709. Pye, Ltd.—Circuit arrangements for reducing the d.c. level of a signal. 20th July, 1959. (879401.)

25192. General Electric Co., Ltd.—Nuclear reactors. 29th July, 1959. (879905.)

25418. Schumacher, G.—Electric current distributing rail. 7th August, 1958. (879909.)

25691. Rendar Instruments, Ltd.—Electrical connectors. 10th August, 1959. (879910.)

25713. Bassani S.p.A.—Electric switches. 11th August, 1958. (879669.)

29257. Standard Telephones & Cables, Ltd.—Measurement of length of magnetisable objects. 11th September, 1959. (879550.)

34487. General Electric Co., Ltd., and Clarke, J. P.—Loudspeaking telephones. 28th October, 1959. (879836.)

35033. Westinghouse Brake & Signal Co., Ltd.—Electronic counting chains. 30th October, 1959. (879837.)

38644. Morphy-Richards, Ltd.—Electric switches. 13th November, 1959. (879434.)

39782. Crabtree & Co., Ltd., J. A., and Heath, R.—Pull operated electric switch such as ceiling switches. 8th September, 1959. (879581.)

40904. General Electric Co., Ltd.—Fuel elements for gas-cooled nuclear reactors. 15th December, 1959. (879863.)

41652. Saunders, A. H.—Electrical connectors. 20th November, 1959. (879864.)

1959

1898. Siemens & Halske A.G.—Electrical plug and socket connectors. 19th January, 1959. (879968.)

2414. General Electric Co., Ltd.—Core structures for heterogeneous nuclear reactors. 22nd January, 1960. (878506.)

2752. General Electric Co., Ltd.—Electric thermal storage space heaters. 26th January, 1960. (878615.)

3271. Bron Elektronik A.G.—Electronic flask lamps. 29th January, 1959. (878640.)

3414. Superflexit, Ltd.—End fittings for use with flexible electrical conduits. 20th January, 1960. (879865.)

4437. Westinghouse Electric Corporation.—Electrical control apparatus for moving bodies. 9th February, 1959. (878880.)

5657. Associated Electrical Industries, Ltd.—Suspension devices. 2nd February, 1960. (878507.)

5807. A.E.I.-John Thompson Nuclear Energy Co., Ltd.—Remote inspection equipment. 1st February, 1960. (879529.)

6787. Valchera, V.—Power factor correction circuits for gas discharge lamps. 29th January, 1960. (878925.)

6934. General Electric Co., Ltd.—Fuel handling arrangements for nuclear reactors. 26th February, 1960. (878881.)

10435. Austin, N. J.—Electric adaptor plugs. 24th March, 1960. (879357.)

10590. Standard Telephones & Cables, Ltd.—Manufacture of an electrical capacitor and particularly to a roll-type capacitor. 26th March, 1959. (879674.)

11462. Associated Electrical Industries, Ltd.—Electric switches. 1st April, 1960. (879813.)

12140. Belling & Lee, Ltd.—Seals substantially impervious to electromagnetic energy. 10th April, 1959. (879675.)

13767. Electricity Trust of South Australia.—Attachment of insulators to their pins. 22nd April, 1959. (879743.)

14451. Marconi's Wireless Telegraph Co., Ltd.—Magnetron circuit arrangements. 2nd October, 1959. (879677.)

15914. Ultra Electronics, Ltd.—Magneto resistive devices. 21st April, 1960. (879384.)

17376. Wayne Kerr Laboratories, Ltd., and Chapman, G. C.—Pulse generators. 20th May, 1960. (879912.)

18257. Fiat S.p.A.—Commutators for dynamo-electric machines and method of manufacturing. 28th May, 1959. (879599.)

20708. Ferranti, Ltd.—Moving coil voltage regulators. 27th May, 1960. (879686.)

24651. Associated Electrical Industries, Ltd.—Inductive loop communication systems. 5th July, 1960. (879606.)

25397. Marconi's Wireless Telegraph Co., Ltd.—Selection switch devices. 7th January, 1960. (879920.)

25645. Electric Storage Battery Co.—Lead-acid batteries. 27th July, 1959. (879970.)

26346. Standard Telephones & Cables, Ltd.—Semiconductor devices. 31st July, 1959. (879390.)

26816. Naimer, H. L.—Method of manufacturing cams for electrical equipment, particularly switches. 5th August, 1959. (879921.)

30098. General Electric Co.—Two-tier turbine and compressor blades. 3rd September, 1959. (879444.)

30419. Westinghouse Electric Corporation.—Manufacture of semiconductor devices. 7th September, 1959. (879492.)

31018. Canadian Westinghouse Co., Ltd.—Inductive devices. 11th September, 1959. (879614.)

32029. Joy Manufacturing Co.—Compressor unloader devices. 21st September, 1959. (879343.)

32381. Burndy Corporation.—Electrical connectors. 23rd September, 1959. (879344.)

34271. Westinghouse Bremsen G.m.b.H.—Electro-pneumatic door opening and closing apparatus. 9th October, 1959. (879445.)

35495. Marconi's Wireless Telegraph Co., Ltd.—Radio telegraph transmitting installations and systems. 14th April, 1960. (879887.)

35712. Brown, Boveri & Cie. A.G.—Magnetic core. 21st October, 1959. (879730.)

38296. Bendix Corporation.—Sealed pressure-operated electric switches. 11th November, 1959. (879329.)

42882. Standard Telephones & Cables, Ltd.—Method and apparatus for joining electric conductors. 17th December, 1959. (879557.)

43525. General Ultrasonics Co.—Auto-polarisation of electrostrictive transducers. 22nd December, 1959. (879824.)

1960

2471. Hamilton Watch Co.—Escape wheel for electric clocks. 22nd January, 1960. (879640.)

6982. Westinghouse Electric Corporation.—Preparation of semiconductor devices. 29th February, 1960. (879406.)

7524. Compagnie Industrielle des Telephones.—Device for measuring the temperature inside nuclear reactors. 3rd March, 1960. (879407.)

9286. Philips Electrical Industries, Ltd.—Mixing circuits for high frequencies. 16th March, 1960. (879934.)

11594. Loblite, Ltd.—Electric light fittings. 1st April, 1960. (879502.)

14532. Westinghouse Electric Corporation.—Semiconductors. 26th April, 1960. (879898.)

16497. Lignes Telegraphiques et Telephoniques.—Short-circuit devices for waveguides. 10th May, 1960. (879409.)

21030. Philips Electrical Industries, Ltd.—Circuit arrangements for frequency modulation. 15th June, 1960. (879507.)

21966. North American Aviation, Inc.—Steam superheat boiling water nuclear reactor. 23rd June, 1960. (879282.)

23469. Mullard, Ltd.—Peak voltage detector circuit. 5th July, 1960. (880000.)

25220. Telefunken G.m.b.H.—Method of manufacturing semiconductor devices. 20th July, 1960. (879416.)

26237. Standard Telephones & Cables, Ltd.—Electrical high frequency strip transmission line arrangements. 28th July, 1960. (879826.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Aberdeen.—Corporation. 27th November. Supply of electric lamps during the year 1962. (See Classified Advertisement Section.)

Argentina.—Water and Electric Power Board. 4th December. Transformer station. (E.S.B. 33177/61.)*

Australia.—Water Sewerage and Drainage Board, Sydney. 12th December. Two electrically driven centrifugal pumping units. (E.S.B. 33147/61.)*

Basildon.—U.D.C. 10th November. Group "B" street lighting. (See Classified Advertisement Section.)

Batley.—Corporation. 11th November. Trunk road lighting equipment. (See Classified Advertisement Section.)

Burma.—Union Purchase Board, Rangoon. 8th November. Electrical accessories. (E.S.B. 33727/61.)*

Egypt.—Cairo Electricity and Gas Administration. 5th December. Double-circuit 63 kV underground oil-filled cable. (E.S.B. 33133/61.)*

Formosa.—Central Trust of China, Taiwan. 7th November. Electronic temperature indicators. (E.S.B. 33135/61.)*

Hong Kong.—Crown Agents for Overseas Governments. 28th December. Electrical plant for Plover Cove and Hebe Haven water scheme. (See Classified Advertisement Section.)

India.—Punjab State Electricity Board. 14th December. Electrical equipment. (E.S.B. 33491/61.)*

Singareni Collieries Company, Ltd. 27th November. 24 portable electric haulers. (E.S.B. 33463/61.)*

Iraq.—Ports Administration, Margil. 12th November. 100 underwater electric floodlights. (E.S.B. 33439/61.)*

Ministry of Municipalities. 24th November. Electrical machinery. (E.S.B. 33448/61.)*

Kuwait.—Department of Electricity, Water and Gas. 12th November. Street lighting feeder pillars. (E.S.B. 33469/61.)* 15th November. Street lighting and floodlighting equipment. (E.S.B. 33743/61.)*

Longbenton.—U.D.C. 24th November. Street lighting conversion scheme. (See Classified Advertisement Section.)

Manchester.—Housing Committee. 20th November. Communal TV distribution installation. (See Classified Advertisement Section.)

New Zealand.—Hamilton City Council. 24th November. One 11 kV switchboard and four 11 kV ring main units. (E.S.B. 33459/61.)*

Pakistan.—Director (Stores) Electricity, Lahore. 28th November. 2,500 lb tinned copper fuse wire and 300 lb pure lead fuse wire. (E.S.B. 33473/61.)* 29th November. Cable boxes. (E.S.B. 33472/61.)*

Petersfield.—R.D.C. 4th December. Relighting part of trunk road at Liphook and Horndean. (See Classified Advertisement Section.)

Singapore.—City Council Electricity Department. 24th November. Cables. (E.S.B. 33489/61.)*

Southampton.—Corporation. 18th November. Electrical installation at College of Technology. (See Classified Advertisement Section.)

Sudan.—Railway Stores Department. 29th November. Automatic starters. (E.S.B. 33171/61.)*

Department of Posts and Telegraphs. 4th December. Cable. (E.S.B. 33168/61.)* 11th December. Radio-telephone sets. (E.S.B. 33187/61.)* 12th December. Radio-telephones. (E.S.B. 33188/61.)* 20th December. Telephone equipment. (E.S.B. 33184/61.)*

United States.—Bureau of Reclamation, Colorado. 24th November. Generator voltage bus structure, low voltage feeder busways and switchgear assemblies. (E.S.B. 33733/61.)*

ORDERS PLACED

Gateshead.—Corporation. Electrical installation in Gateshead Boys' Grammar School (£12,438).—Campbell & Isherwood.

London.—Poplar Housing Estates Management Committee. Electrical installation work and fittings, Block "J," Newby Place (£2,920).—Electric Contracts (London).

Luton.—Airport Committee. Electrical installation work in new hangar (£4,275).—B. Thomas.

Newcastle-on-Tyne.—Regional Hospital Board. Electrical installation in connection with new boiler plant at Newcastle-on-Tyne General Hospital (£17,235).—J. Scott & Co.

Orrell.—U.D.C. Supply and erection of 44 Group "B" columns with 80 W mercury lanterns in Gathurst Road.—Abacus Municipal.

Sheffield.—Education Committee. Electrical services in extensions to the High Storrs Grammar Schools (£15,739).—Tinsley Electric Co.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Carlisle.—Office block, Lowther Street and Lonsdale Street; Johnston & Wright, architects, 13, Castle Street.

Flats (40), Morton estate; city engineer.

Chester.—Extensions to Cheadle County Grammar School for Girls (£50,000); Edgar Taberner, county architect, County Hall, Chester.

Chester-le-Street.—Residential hotel, Blind Lane; Freeman, Son & Curry, solicitors, 11, Victoria Road, Darlington.

Chichester.—Flats for elderly persons (47), Spitalfield Lane; city engineer, Greyfriars, North Street.

Colchester.—Fire brigade workshops at Lexden (£86,000); county architect, County Hall, Chelmsford.

Darlington.—Four-storey light industrial and storage building, etc., for Snaith & Son; H. B. Richardson, architect, 3, Skinnergate, Darlington.

Dudley.—Works extensions; Round Hill Steel Works, Ltd., Round Oak Road.

Easington (Co. Durham).—Houses (359), Chapel Hill, for Peterlee Development Corporation, Shotton Hall, Castle Eden.

Folkestone.—Factory, Biggins Wood Road site: F. W. Maul & Son, 78, Tontine Street, Folkestone.

Glasgow.—Dwellings (136), Hillington Terrace; director of housing, 20, Trongate.

Grantham.—Central kitchen, staff dining accommodation, sisters' and nurses' home and maternity block at the Grantham and Kesteven General Hospital; F. J. Lenton & Partners, architects, 16, Finkin Street, Grantham.

Leicester.—Factory, Vaughan Way; Davis Manufacturing Co., Ltd., 86, Highcross Street.

Leicestershire.—Teaching block at Kirby Muxloe County School; county architect, 123, London Road, Leicester.

London.—Eight-storey block of dwellings, Sutherland Grove, Wandsworth; A. Beasley, borough architect, Municipal Buildings, S.W.18.

Research centre, Drury Lane, Holborn; Medical Research Council, Old Queen Street, S.W.1.

Extension, London Clinic, Marylebone Road; Gunton & Gunton, architects, Empire House, St. Martin's-le-Grand, E.C.1.

Twelve-storey block of flats, College Road, Dulwich; Geo. Watt, architect, 146, Mostyn Road, S.W.19.

Maidstone.—Houses (57), Bicknor Road/Selby Road site; borough engineer, Palace Avenue.

Middlesbrough.—Old people's hostel at Pallister Park (£64,000); J. A. Kenyon, borough engineer.

Newcastle-on-Tyne.—Further development schemes in the Scotswood Road area, including shops, blocks of flats, maisonettes and car parking garage for City Council (£3,750,000); city architect, 18, Cloth Market.

Nottingham.—Chemical laboratory block; Boots, Ltd., Station Street.

Plymouth.—Factory for Jantzen, Ltd., Great West Road, Brentford; Humphreys, Ltd., Market Place, Plympton.

Ramsgate.—Factory, Westgate estate; T & G. Tools, Ltd., Togre Works, Lillian Road.

Salford.—Four-storey maternity unit at Hope Hospital; regional architect, Manchester Regional Hospital Board, Cheetwood Road, Manchester, 8.

Shotley Bridge (Co. Durham).—Additions to General Hospital; P. H. Knighton, chief architect, Newcastle Hospital Board, Benfield Road, Newcastle-on-Tyne.

Southampton.—Houses (31), Summit Way, and two blocks of five-storey flats, Townhill Park; borough engineer, Civic Centre.

Stevenage.—Office block, town centre; Harry Neal, Ltd. 117, Baker Street, W.1.

Sunderland.—Four-storey shopping block, Union Street; Boyer & Partners, architects, 88, Grays Inn Road, London, W.C.1.

Wallsend.—Factory block, Neptune Road, for Thermal Syndicate Co., Ltd.; L. J. Couves & Partners, architects, Grainger Chambers, Hood Street, Newcastle-on-Tyne.

Walsall.—West Midlands Teachers' Training College (£600,000); director of education, Darwall Street, Walsall.

Welwyn Garden City.—Factory and research block for Roche Products, Ltd.; Harry Neal, Ltd., 117, Baker Street, W.1.

West Bromwich.—Dwellings (120), Great Barr estate; Coal Industry Housing Association, Himley Hall, Dudley.

Wimbledon.—Extensions to North House Residential School (£175,000); Geo. Fairweather & Partners, architects, 28, Wigmore Street, W.1

Worthing.—R.C. church at Westways, Hayling Rise, for R.C. Diocese of Southwark; D. Bedford & Son, architects, 1, Liverpool Terrace, Worthing.

Yeovil.—Scheme for the erection of new hospital, Kingston/Higher Kingston site; M. O. Carter, secretary, South Western Regional Hospital Board, Tyndalls Park Road, Bristol, 8.

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* This information is extracted from the Board of Trade *Export Service Bulletin.* Inquiries should be addressed to the Board of Trade, Export Services Branch, Lacon House, Theobald's Road, London, W.C.2 (Telephone: Chancery 4411, Ext. 738), quoting the reference given.

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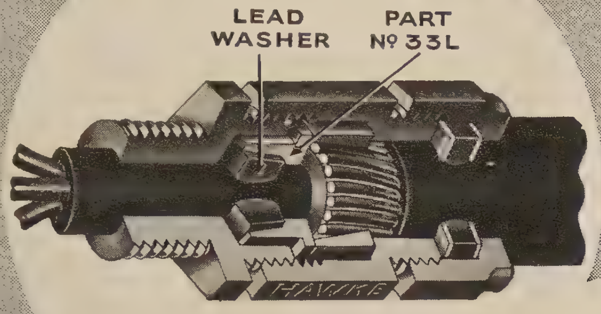

The parts shown replace normal parts Nos. 22 and 33 for lead sheathed cables

This alternative method can be applied on the following glands: G62, G63, G64, G65, G67 and G68.

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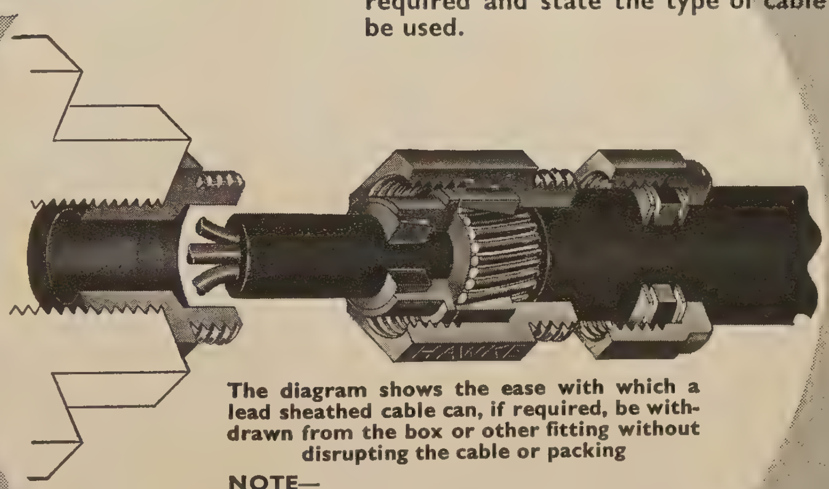

The diagram shows the ease with which a lead sheathed cable can, if required, be withdrawn from the box or other fitting without disrupting the cable or packing

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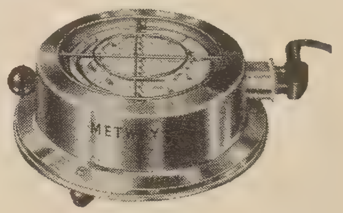

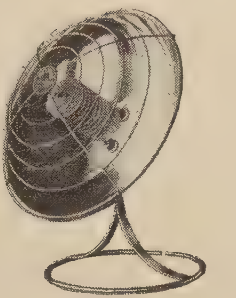

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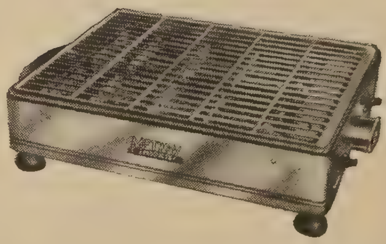

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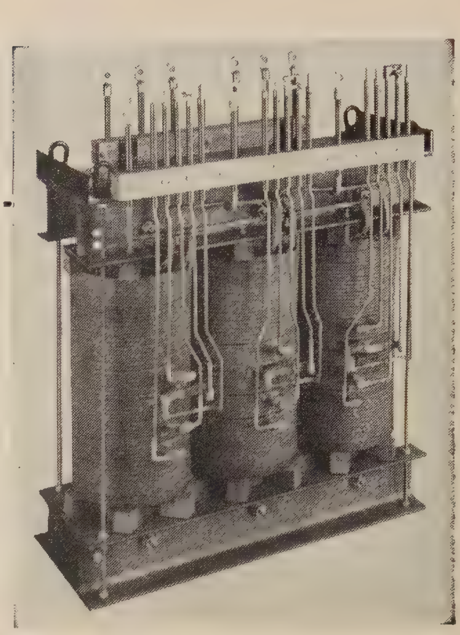

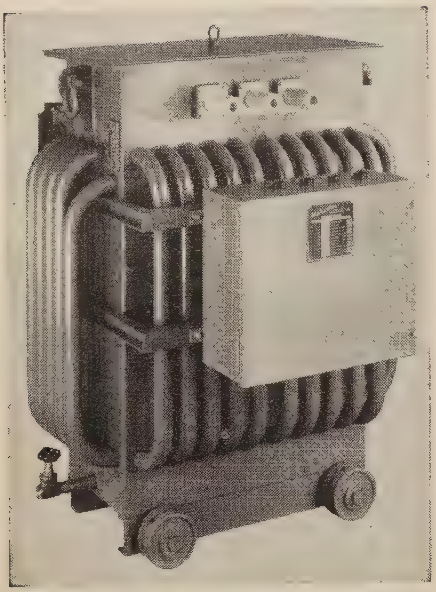

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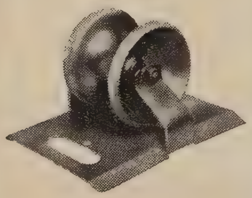

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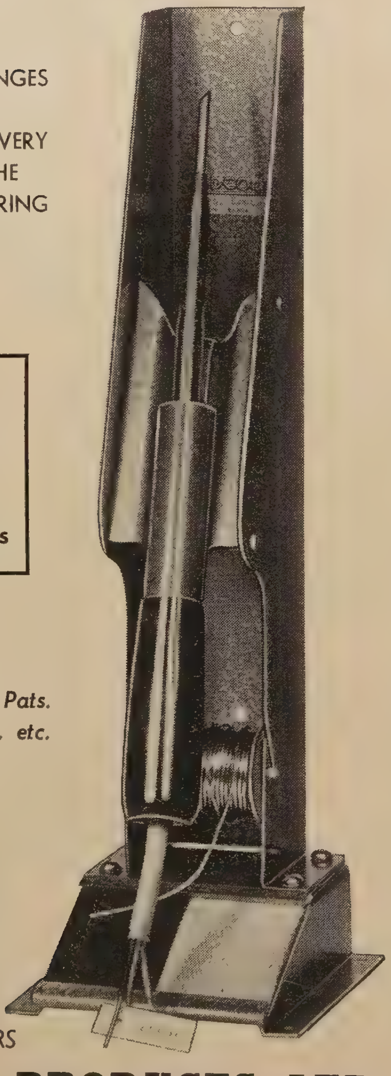

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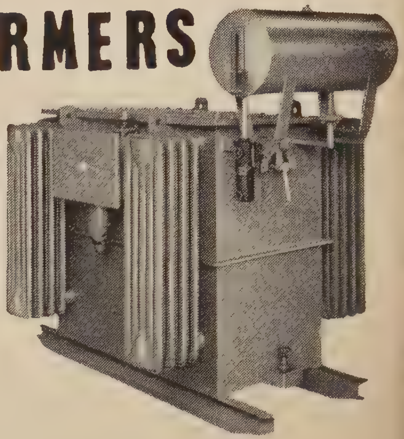

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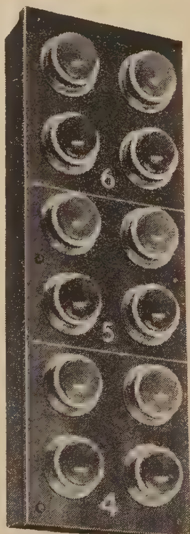

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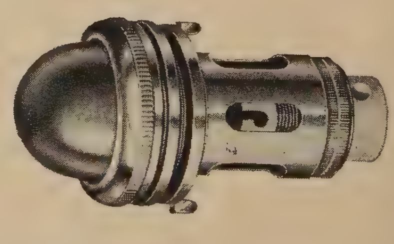

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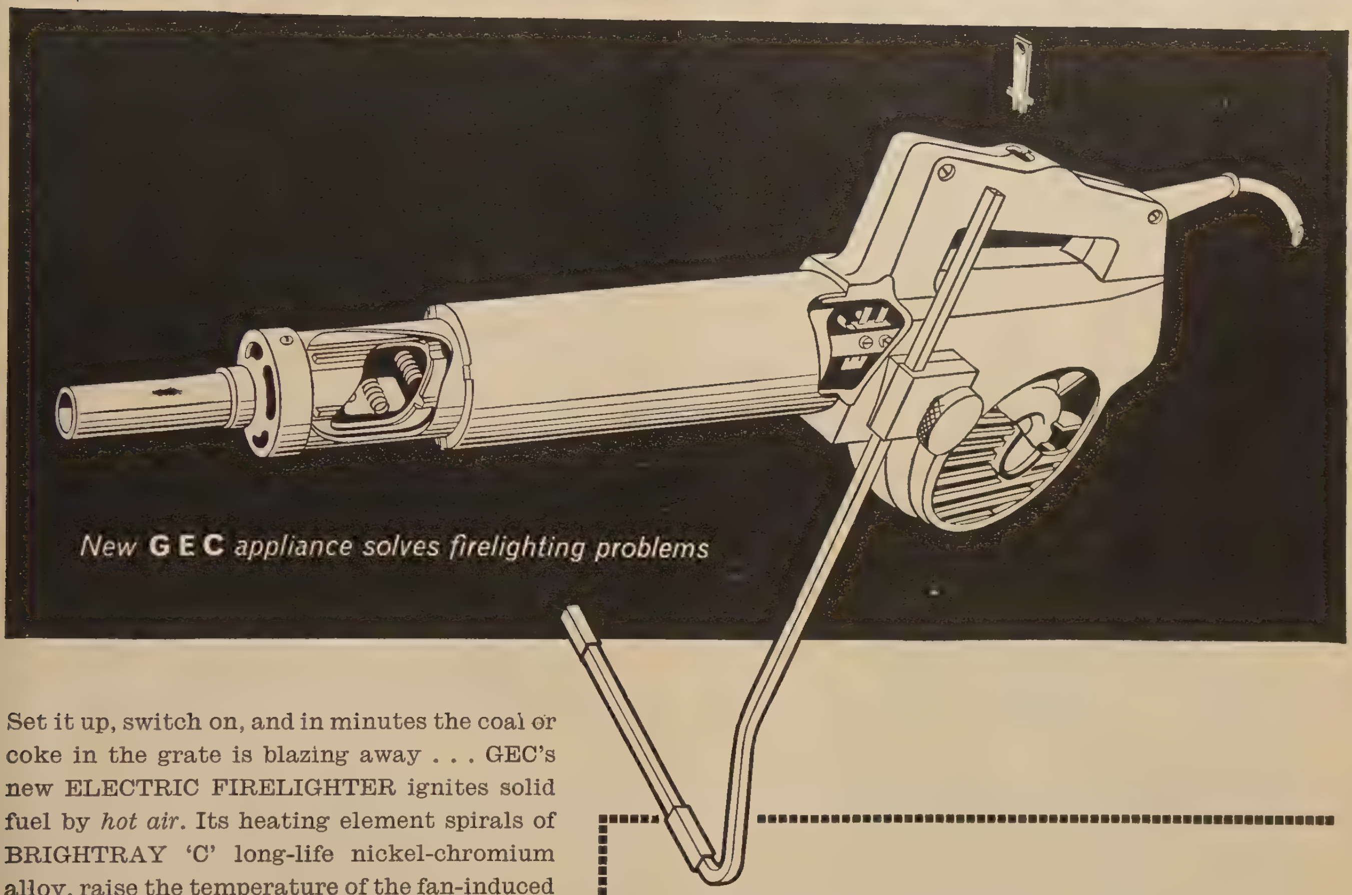

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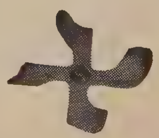

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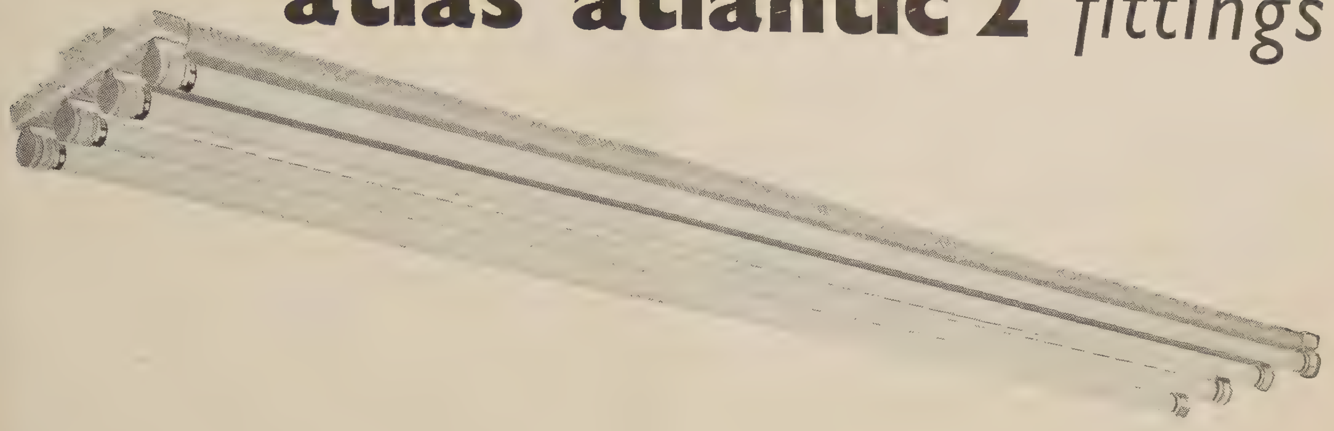

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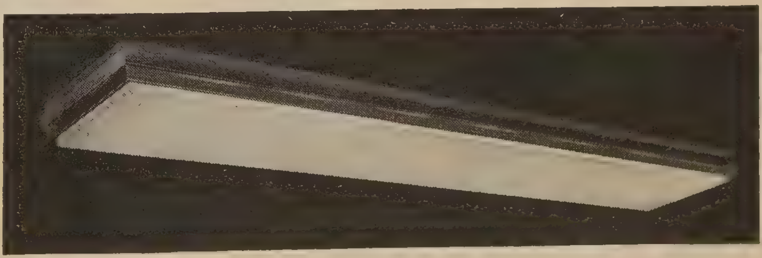

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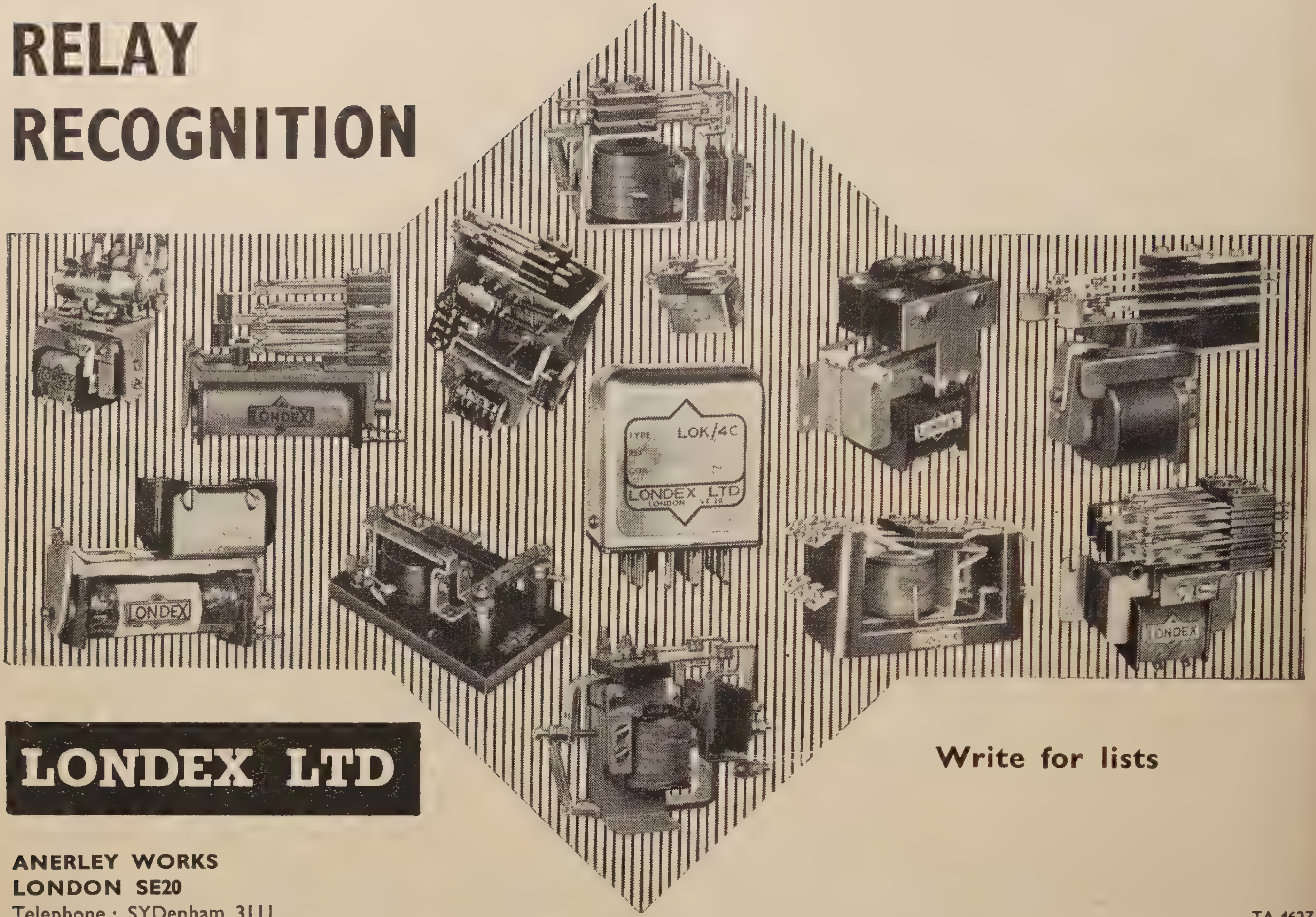

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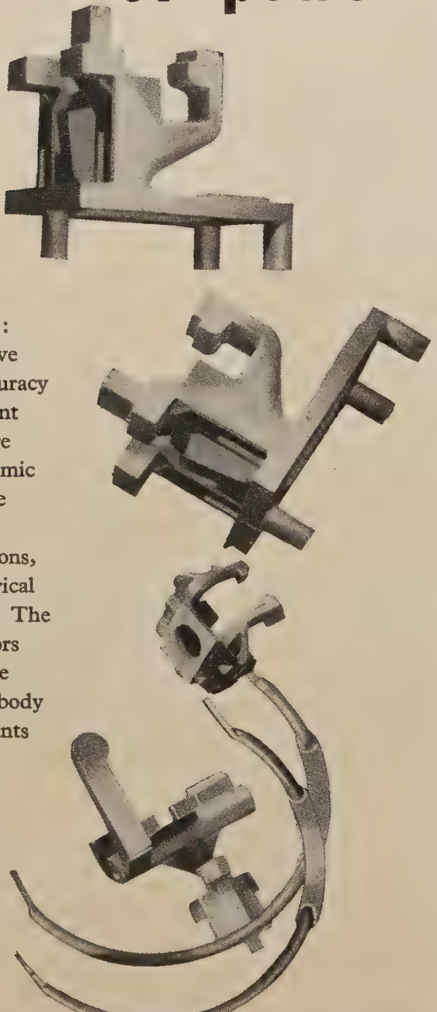

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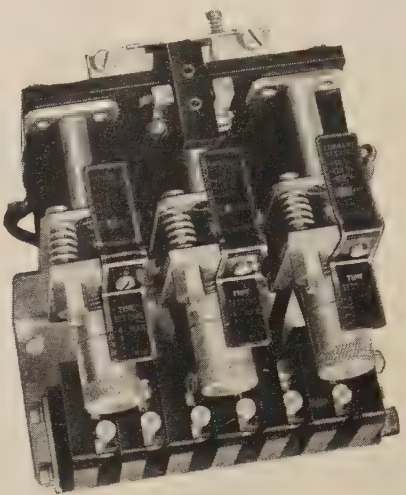

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KEMPSTON ELECTRICAL CO. LTD.
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For Commutator
Maintenance Equipment
Consult the experts . . .

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ELECTRIC COMPANY LIMITED
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NECO COAXIAL DRIVE GEARED MOTORS CUT COSTS

✻ h.p.—type HD, $\frac{1}{2}$ to 2—type DS $\frac{1}{6}$ to $\frac{1}{2}$—type 25, $\frac{1}{8}$ ✻ torque output—HD up to 200 lb. ft.—DS up to 100 lb. ft.—25, 25 lb. ft. ✻ output speeds with 1400 r.p.m. motor—HD. 480 to 0·62 r.p.m.—DS, 475 to 0·2 r.p.m.—25, 812 to 0·079 r.p.m. ✻ enclosures—drip proof, totally enclosed and T.E.F.C. ✻ all supplies, including D.C. ✻ foot or flange mounting ✻ gearboxes also supplied as speed reducers ✻ competitive prices ✻ *Quick delivery—specials made at minimum cost with little delay.*

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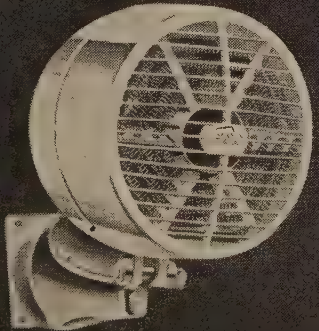
Because G.E.C. is expert both in the manufacture and the application of electric industrial heating units, it is able to effect considerable economies—in layout, in erection time and in fuel consumption. If you have any problems, our free advisory service will be pleased to help you without obligation.

G.E.C. has the answer



◀ **TWIN-ZONE OVERHEAD RADIANT HEATERS** Instant glowing warmth where overall air heating would be too costly. Adjustable reflectors give concentrated or widespread beam.

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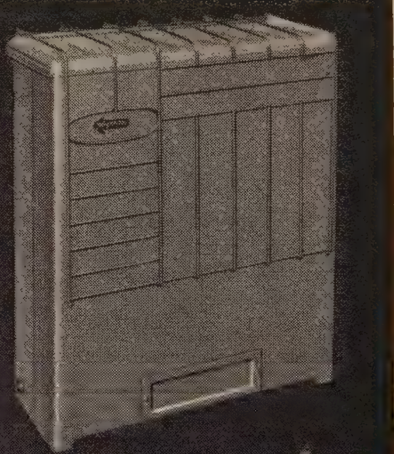
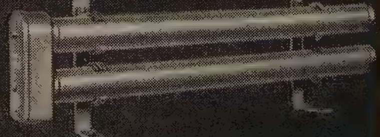
NIGHTSTOR HEATERS. Use electricity at night when cheaper off-peak tariffs are available. From 1 to 3 kW. ▶

TUBULAR HEATERS. Available in various lengths up to 4-Way banks. A versatile type of heating for numerous applications. ▶





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Industrial bells

Friedland bells operate by alternating or direct current from 6 to 250 volts.
Write for leaflet giving full specification of the complete range.

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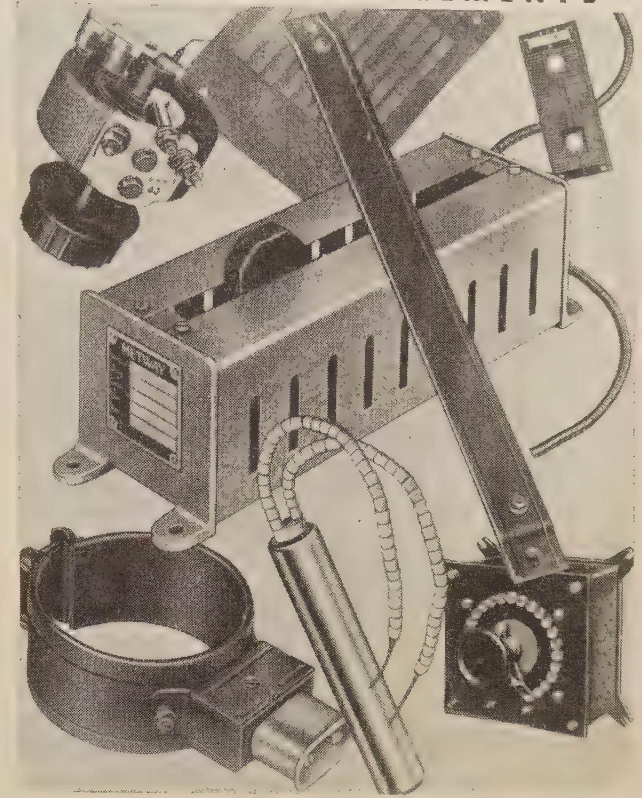

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"CORREX" TENSION GAUGES

The only instrument solely designed for accurately measuring tension on Relays, Contacts, Switchgear, and electrical apparatus of all kinds. Gauge measures in grammes, and a large range of sizes is produced to cover from 0.3-2,000 grammes.
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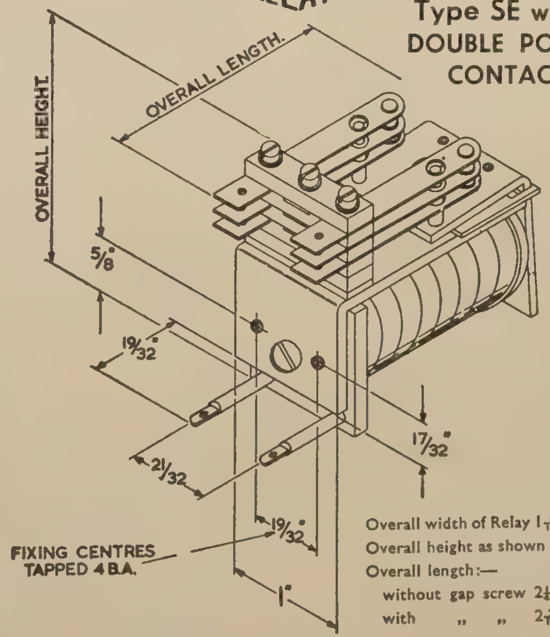
RELAYS

Type SE with
DOUBLE POLE
CONTACTS



Overall width of Relay 1$\frac{1}{16}$"
Overall height as shown 2"
Overall length:—
without gap screw 2$\frac{1}{4}$"
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Switching capacity at 250 volts AC or 24 volts DC
5 to 8 amps under appropriate conditions
Coils for up to 250 volts AC or 110 volts DC
Details of other types are available on request

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to equal the LEAD acid battery
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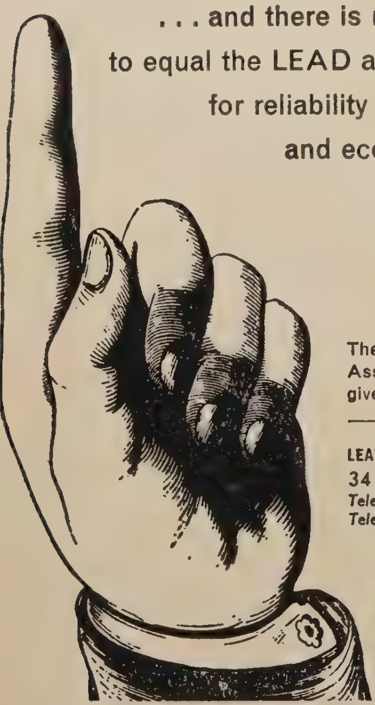

The technical officers of the Association are always glad to give individual assistance.

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Telephone: GROsvenor 8422
Telegrams: Leadevep, Wesdo, London

LDA4/61

PLASTIC CABLE CLIPS

The Cable Clip is designed to 'push fit' on to the cable.
The carbon steel pin is already part of the unit and will drive into wood, plaster or mortar

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All types of industrial brushes, vacuum cleaner and drill brushes.

Industrial Brushes—
24-HOUR SERVICE given to urgent or breakdown jobs.

When ordering please supply sample or detailed drawing.

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Brochure or Grade List on request.

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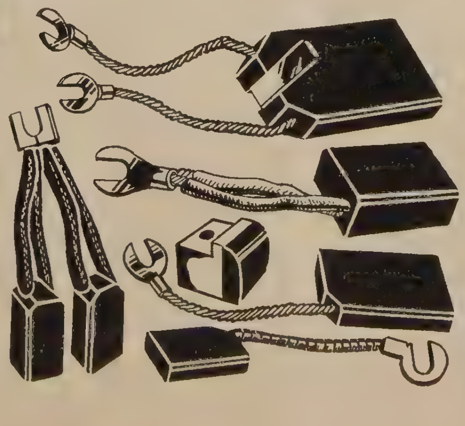

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DIOPAL The competitive fitting designed to meet the demand for a medium priced prismatic lighting fitting combining the required essentials with excellent appearance. The opalescent prismatic glass gives wide light dispersion and the body and frame are die-cast from high quality aluminium alloy (L33) which is anti-corrosive. The frame incorporates an asbestos gasket to exclude dust and water.

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DIOPAL fittings are specially designed for lighting corridors, stores, stairways, archways, garages, platforms, and similar buildings.

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Tel: CENtral 2009
GLASGOW 73 Robertson Street, Glasgow 3.2
Tel: CENtral 2479

To DORMAN & SMITH LTD., Preston, Lancashire.

Please send latest Lighting Fittings Catalogue

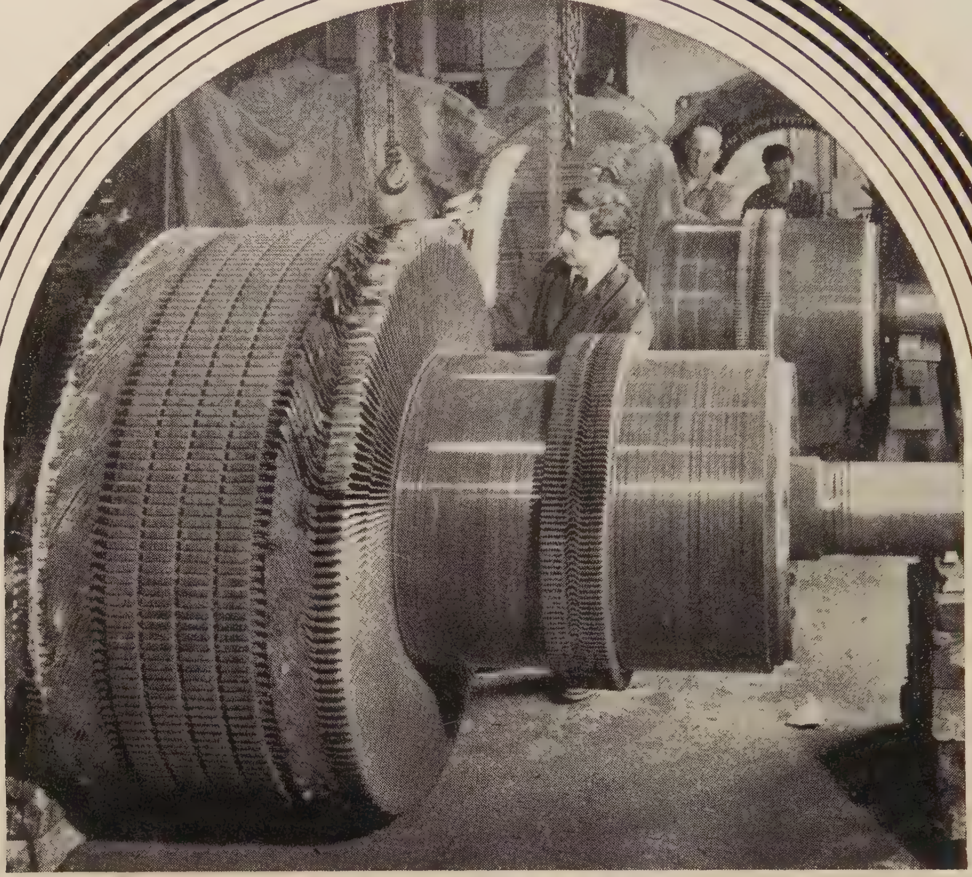
NAME ……………………………………

POSITION ……………………………………

FIRM ……………………………………

ADDRESS ……………………………………

ER/3/11/61



Engineers' Language! For every Plant Engineer who swears at Collins, there are ninety-eight and a quarter who swear by them. Engineers being engineers, this is quite something. As we were saying, we show two 1500kW 240-volt 600 r.p.m. D.C. Generators, one being stripped out for rewinding, t'other being rewound.

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22 St. Albans Place Upper Street Islington N 1
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9 & 11 Featherstone Road Southall
Phone Holborn 0212-4 Canonbury 3227-8
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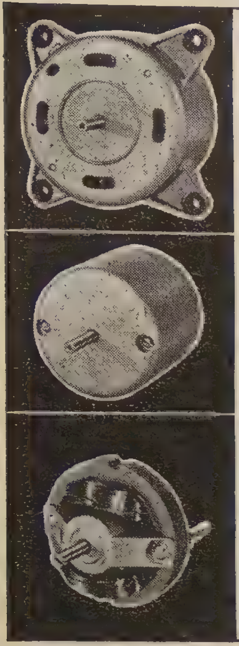
HIGH QUALITY
Fractional horse-power electric motors



1-20 watts output for

fan units — heaters — projectors — cooling equipment — tape recorders record players, etc.

Geared Motors for special applications

Silent running with self lubricating sintered bronze bearings

A Variety of fixings with open, semi-enclosed or enclosed housings

Comprehensive Catalogue forwarded on request

Sole distributors:—
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Wrigley *Regd.*

ELECTRIC FORK LIFT
MODEL E.650 MK. III

- **1500 lb. load rating**
- **Electric battery operated**
- **6 in. free lift—lifts to 9 ft.**
- **Turns in own length**

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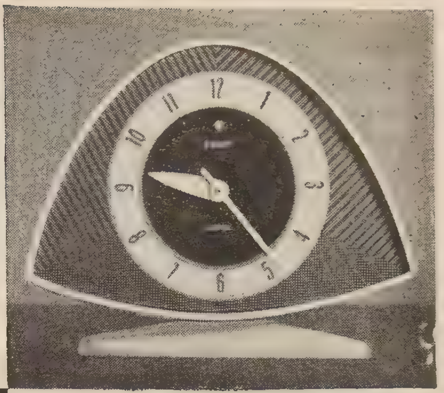
To meet the 'call' of contemporary taste



call rise

This 'Sectric' Alarm in white case features a bold dial in white, black and gold. Spot luminous. £2.5.6.

call star

The white moulded case of this 'Sectric' alarm has an attractive maroon or black border. Spot Luminous £2.5.6.

call alite

'Sectric' alarm with bedside lamp. Maroon or black dial with matching shades. £3.6.0.

They're on the way . . . these new and specially designed 'Sectric' alarms, embodying the very latest production techniques. Winners like the 'Page' and 'Pageboy'! Perfect gift lines! Certain to attract fresh sales wherever the call is for contemporary styles. Ask your wholesaler for details of new display stands for Sectric alarms available shortly.

SMITHS 'SECTRIC' ALARMS

SMITHS CLOCK & WATCH DIVISION
Sectric House, London, N.W.2. *Showrooms: 179 Great Portland Street, W.1.*

"ELMO"

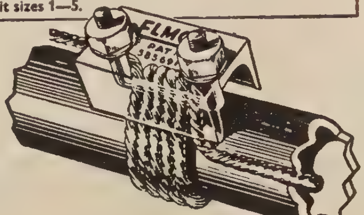
EARTHING CLAMPS

A COMPLETE RANGE TO B.S.951. 1948

IN 4 SIZES

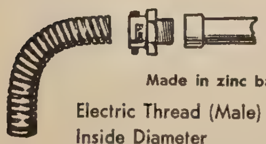
	A123	B45	C67	D8910
for earthing cables up to	7/0.036"	7/0.064"	19/0.064"	19/0.083"
to fit B.S. conduit sizes	1, 2 & 3	4 & 5	6 & 7	8, 9 & 10
i.e. in trade terms	$\frac{1}{2}$" to $\frac{3}{4}$"	1" and $1\frac{1}{4}$"	$1\frac{1}{2}$" and 2"	$2\frac{1}{4}$" to $3\frac{1}{2}$"

NOTE ALSO: Type A123 is suitable for Earthing Cables up to 7/0.029" and for B.S. conduit sizes 1—5.



"Elmo" Earthing Clamps are of robust construction. Impossible for wire to pull out, always under tension, therefore a most satisfactory earth and a permanent safeguard.

ELECTRICAL FITTINGS

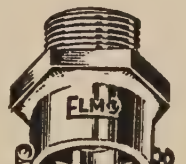


Flexible-to-rigid

CONDUIT COUPLINGS

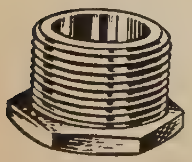
Made in zinc base alloy in the following sizes:

Electric Thread (Male) $\frac{5}{8}$" $\frac{3}{4}$" 1" $1\frac{1}{4}$" $1\frac{1}{2}$" 2"
Inside Diameter $\frac{5}{8}$" $\frac{3}{4}$" 1" $1\frac{1}{4}$" $1\frac{1}{2}$" 2"
Electric Thread (Male) $\frac{5}{8}$" $\frac{3}{4}$" 1" $1\frac{1}{4}$"
Inside Diameter Flexible Conduit $\frac{1}{2}$" $\frac{5}{8}$" $\frac{3}{4}$" 1"



WITH EARTHING TERMINAL

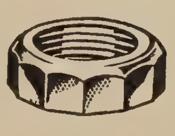
Special Features: Integral Earthing Terminal, tinned ready for soldering. Fixing screw for continuity. Internal Threads suit all makes of flexible tubing.



MALE
Hex. Section

CONDUIT BUSHES

Made in the following sizes:
MALE: Electric Thread
$\frac{5}{8}$" $\frac{3}{4}$" 1" $1\frac{1}{4}$" $1\frac{1}{2}$" 2"
FEMALE: Electric Thread
$\frac{5}{8}$" $\frac{3}{4}$" 1" $1\frac{1}{4}$" $1\frac{1}{2}$" 2"



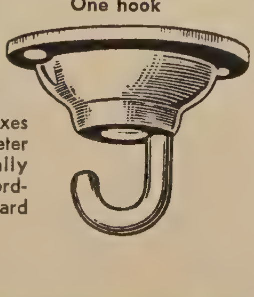
FEMALE
Flat Face Section for Spanner (except $\frac{3}{4}$" size which is round)

CONDUIT HOOK

For fluorescent lamps and overhead lighting fittings. Screwed $\frac{3}{4}$" thread, male electric. Made to fit all standard boxes with two holes 7/32" diameter —2" centres diametrically opposed. Designed in accordance with British Standard Specification.

CEILING PLATE

One hook



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FLEXIBLE CABLES & CORDS

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ELECTRICAL WIRE COMPANY LTD.

Contractors to the Admiralty, War Office and Air Ministry, etc.

Offices and Works: ROAN WORKS, GREENWICH, S.E.10

Grams: "SAXONIST, LONDON." Phones: GREenwich 0463 & 3713

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OFFICIAL NOTICES, TENDERS, ETC.

GOVERNMENT OF HONG KONG

Plover Cove and Hebe Haven Water Scheme

Electrical Plant

THE Crown Agents for Oversea Governments and Administrations, on behalf of the Government of Hong Kong, invite tenders from major electrical manufacturing firms (preferably represented and offering after-sales service in Hong Kong) for the supply and installation of electrical plant for pumping stations and treatment works in the New Territories of Hong Kong. The plant includes switchboards up to 6.6 kV incorporating starters for pumpsets up to 1,150 h.p., transformers, small diesel alternators, distribution boards, air conditioning plant and lighting fittings, whilst the installation includes for all necessary cabling.

Applications for tender documents should be made to the offices of the Crown Agents, quoting reference E.C.2 Hong Kong 4758, and should be accompanied by a deposit of £10, which will be refunded only on receipt of a bona fide tender.

Tenders should be delivered on or before Thursday, 28th December, 1961.

The Consulting Engineers are Messrs. Binnie, Deacon & Gourley, Artillery House, Artillery Row, London, S.W.1, and Messrs. Scott & Wilson, Kirkpatrick & Partners, Manson House, Nathan Road, Hong Kong.

Crown Agents for Oversea
Governments and Administrations.
4, Millbank,
London, S.W.1.

2783

LONGBENTON URBAN DISTRICT COUNCIL

Public Street Lighting

Group IV Conversion Scheme

TENDERS are invited for the supply and erection of 164 Concrete Post Top Lantern Filament Lighting Units.

The plans can be inspected at the office of the Engineer and Surveyor, and specification, schedule and form of tender can be obtained on application to Mr. A. E. Sweetman, M.I.Mun.E., Engineer and Surveyor, Council Offices, Forest Hall, Newcastle upon Tyne, 12, on payment of a deposit of £2 2s., returnable only on receipt of a bona fide tender not subsequently withdrawn and the return of documents loaned.

Tenders in plain sealed envelopes endorsed "Public Street Lighting" must be delivered to the undersigned not later than the 24th November, 1961.

The Council do not bind themselves to accept the lowest or any tender and reserve the right to divide the contract should they so desire.

G. HARRISON,
Clerk of the Council.

2803

RURAL DISTRICT COUNCIL OF PETERSFIELD

Re-lighting of Part of Trunk Road A.3 at Liphook and Horndean, Hants

TENDERS are invited for the supply and erection of Group A lighting installations in the Rural District, as follows:—

Bill No. 1. For the supply and erection of 25 columns and 1 bracket, together with 26 140-watt sodium lanterns, all ancillary gear and fittings, and wiring of equipment at London Road, Liphook.

Bill No. 2. For the supply and erection of 36 columns with 36 140-watt sodium lanterns, all ancillary gear and fittings, and wiring of equipment at London and Portsmouth Roads, Horndean.

Specification and bills of quantities can be obtained from the undersigned on payment of a deposit of £3 3s., which will be refunded on receipt of a bona fide tender not subsequently withdrawn, and the return of all documents.

Tenders, together with fully priced bills of quantities, must be received by me, in the envelope provided, not later than 4th December, 1961.

The Council does not bind itself to accept the lowest or any tender.

G. H. WALKER,
Clerk of the Council.
The Old College,
Petersfield.

2784

BOROUGH OF BATLEY

Trunk Road Lighting Equipment

TENDERS are invited for the supply and delivery of the equipment detailed below for Group A Lighting. The tenderer may tender for the whole or part of the equipment.

21 Reinforced Concrete Columns.
21 Sodium Lanterns, Lamps and Control Gear.
21 Solar Dial Time Switches.

Specification, bill of quantities, schedule of equipment and form of tender may be obtained from the Borough Engineer and Surveyor, Hanover Street, Batley, and tenders, in a plain sealed envelope (not bearing any name or mark indicating the sender) endorsed "Tender for Trunk Road Lighting Equipment," must be delivered to the undersigned not later than the 11th November, 1961.

The Corporation does not bind itself to accept the lowest or any tender.

L. O. BOTTOMLEY,
Town Clerk.

2794

SOUTHAMPTON COUNTY BOROUGH COUNCIL

invites quotations for Electrical Installation at the College of Technology.

Write to Borough Architect, Civic Centre, Southampton, by 18th November, 1961. Quotation returnable by 18th December, 1961.

2782

Advertisements are accepted up to **first post on Monday** of the week of issue

If blocks, bold type or ruled borders are required then on **Friday** prior to week of issue

All communications to be addressed to:
Classified Advertisement Department,
ELECTRICAL REVIEW
Dorset House, Stamford Street
London, S.E.1

Original testimonials should not be sent with applications for employment

---

CORPORATION OF THE CITY OF ABERDEEN

Lighting Department

TENDERS are invited for the supply of Electric Lamps to the Aberdeen Corporation Lighting Department during the year 1962.

Tender forms and details may be obtained from the Superintendent of Lighting, 262, King Street, Aberdeen, to whom tenders should be submitted on or before 27th November, 1961.

J. C. RENNIE,
Town Clerk.
Town House, Aberdeen.

8371

URBAN DISTRICT COUNCIL OF BASILDON

Group B Street Lighting

TENDERS will shortly be invited for supply, delivery and erection of 178 Class B Tungsten Lamps on concrete columns.

Experienced contractors should apply to Engineer and Surveyor, 88, Town Square, Basildon, Essex, by 10th November.

2848

CITY OF MANCHESTER HOUSING COMMITTEE

TENDERS are invited (returnable noon 20th November, 1961) for a Communal T.V. Distribution Installation at Contracts 326 A, B and C, 575 Maisonnettes and Flats, Miles Platting.

Particulars and documents obtainable from the Director of Housing, Town Hall, Manchester, 2.

2849

SITUATIONS VACANT

(See "Replies to Box Numbers" above)

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Southern Division, South Western Region

ASSISTANT ENGINEER (Instrument)

PORTSMOUTH GENERATING STATION.

Candidates should have previous experience of modern generating station plant and a sound knowledge of instruments and other measuring apparatus used in generating stations.

Applicants should have had a sound technical training and should possess qualifications leading to corporate membership of an appropriate professional institution, or hold equivalent qualifications.

Salary N.J.B. Scale 7, Grade H.10, £965-£1,090 per annum.

Special application forms obtainable from Divisional Secretary, 111, High Street, Portsmouth, should be returned by 14th November, 1961.

2850

***Situations Vacant** (continued)*

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APPLICATIONS are invited for the following superannuable posts :—

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THIRD ASSISTANT DISTRICT ENGINEERS
(South East and South West Districts).

Experience necessary in the construction, operation and maintenance of large H.V. and M.V. underground distribution and protective systems. Technical qualifications desirable. Salary £1,190/£1,325 per annum (N.J.B. Class K, Grade 9).

Apply by letter within 14 days, stating age, experience, present position and salary, to Emil Braathen, Area Manager, Midlands Electricity Board, 14, Dale End, Birmingham, 4.

Central Gloucestershire Area

DEMONSTRATOR (Female)
(Dean Forest).

Applicants must have a good education and should have a certificate of a recognised training college and/or the E.A.W. Certificate and at least two years' training and experience. Applicants must be prepared to take an active part in the sales organisation and selling experience would be an advantage. Duties include lecture demonstrations in service centres and on consumers' premises and advice to consumers on the selection and use of electrical apparatus. Salary £600/£700 per annum (N.J.C. Grade 1).

Apply by letter within 14 days, stating age, education, qualifications, training and experience, to Mr. S. Raybould, Area Manager, Midlands Electricity Board, Eastern Avenue, Gloucester.

North Staffs. Area

THIRD ASSISTANT DISTRICT ENGINEER (Draughtsman) (Stafford).

The successful applicant to be responsible for the drawing office. Candidates should have a sound technical education and experience in the preparation of engineering drawings and electrical diagrams. Salary £890/£1,015 per annum (N.J.B. Class F, Grade 9).

GENERAL ASSISTANT DISTRICT ENGINEER (Draughtsman) (Stoke South).

Applicants should have had a sound technical education and experience in the preparation of engineering drawings and electrical diagrams. Salary £765/£870 per annum (N.J.B. Grade G.12).

Apply by letter within 10 days, stating age, experience, qualifications, present position and salary, to Mr. C. C. Pimble, Area Manager, Midlands Electricity Board, 234, Victoria Road, Fenton, Stoke-on-Trent.

South Staffs. and North Worcs. Area

GENERAL ASSISTANT DISTRICT ENGINEER (Brierley Hill).

Applicants should have suitable technical qualifications and training in engineering duties associated with electricity distribution systems. Salary £825/£940 per annum (N.J.B. Grade G.11).

Apply by letter within 14 days, stating age, experience, present position and salary, to Mr. D. Holt, Acting Area Manager (Ref. EMI/SEC), Midlands Electricity Board, P.O. Box No. 9, Toll End Road, Tipton, Staffs.

DEMONSTRATOR (Female)
(Wednesbury).

Applicants must have a good education and should have a certificate of a recognised domestic training college and/or the E.A.W. Certificate and have at least two years' training and experience. Duties include lecture demonstrations in service centres and on consumers' premises and advice to consumers on the selection and use of electrical apparatus. Salary £600/£700 per annum (N.J.C. Grade 1).

Apply by letter within 14 days, stating age, education, qualifications, training and experience, to District Manager, Midlands Electricity Board, Camp Street, Wednesbury.

F. W. CATER,
Secretary.

2843

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region

Research and Development Department

Third Assistant Engineer, Electrical Branch
(Vacancy No. S.E.54/61)

APPLICATIONS are invited for the post of THIRD ASSISTANT ENGINEER in the Measurements and Instrumentation Section. The post will be located at West Farm Place, Cockfosters, and the successful applicant will be expected to reside within a reasonable distance of Cockfosters.

The successful candidate will be responsible to the Measurements and Instrumentation Section Head and will carry out special field work, developing his own techniques in radio and television interference measurements, noise level measurements, noise suppression, harmonic and vibration analysis, mechanical stress and strain analysis and allied work. This post requires experience in electronics and measurement techniques.

A recognised electrical engineering qualification leading to Corporate Membership of the Institution of Electrical Engineers or qualifications leading to Corporate Membership of the British Institution of Radio Engineers is desirable, and previous research and development experience would be an advantage.

Salary, dependent on qualifications and experience, within the range of £1,215-£1,780 per annum, including London allowance, in accordance with N.J.B. Salary Agreement, Class L, Grade 6/7/8.

Applications, quoting vacancy number and stating age, qualifications, experience, etc., should be forwarded to the Regional Secretary, Ergon House, Horseferry Road, London, S.W.1, to arrive not later than 18th November, 1961.

2810

SENIOR ELECTRICAL DRAUGHTSMAN

required by

KODAK LIMITED

to work in its Project and Design Department. This department is a member of the Engineering Division, where over 1,000 people are employed.

Candidates should be experienced in the preparation of schemes and specifications for internal distribution systems for factories. Qualifications up to H.N.C. or equivalent.

Salary within range £900 - £1,120, depending on experience.

The company offers excellent employee benefits, including an annual bonus, a voluntary part-contributory life insurance plan and a pension scheme.

Please apply, quoting JAW/17 :—

Men's Personnel Department
KODAK LIMITED (Factories)
Harrow, Middx.

2844

SOUTH OF SCOTLAND ELECTRICITY BOARD

Glasgow Area

APPLICATIONS are invited from suitably qualified engineers for the following superannuable appointments :—

(1) THIRD ASSISTANT ENGINEER
(Construction)
(Ref. No. GE/74/61).

Candidates should have a sound theoretical knowledge and practical training with experience in the erection and commissioning of E.H.V. switchgear, transformers and protective gear and general substation construction work, and be capable of supervising engineers working in a junior capacity. Corporate Membership of the Institution of Electrical Engineers or equivalent qualification is desirable.

Salary £1,275-£1,410 per annum in accordance with Class L, Grade 9 (Scale 11) of the N.J.B. Salary Scale.

(2) THIRD ASSISTANT ENGINEER
(Planning and Development)
(Ref. No. GE/71/61).

Candidates for this post should preferably be in possession of the H.N.C. in Electrical Engineering or equivalent qualification and should have a sound engineering training with subsequent experience in the design and layout of large distribution systems at pressures up to and including 33 kV in a densely loaded industrial and residential area. A knowledge of the application of modern protective equipment and of the calculation of fault levels and preparation of load flow diagrams is desirable.

Salary £1,190-£1,325 per annum in accordance with Class L, Grade 10 (Scale 10) of the N.J.B. Salary Scale.

(3) FOURTH ASSISTANT ENGINEER
(Meter, Test and Protection)
(Ref. No. GE/72/61).

Candidates for this post should preferably be in possession of the H.N.C. in Electrical Engineering or equivalent qualification. The successful candidate will be primarily concerned with the installation and in situ testing of polyphase metering and ancillary equipment. Experience in the use of potentiometer equipment to comply with the requirements of the Electricity Supply (Meter) Act, 1936, will be an advantage.

An opportunity to gain experience in other work in the section will be given.

Salary £965-£1,090 per annum in accordance with Class L, Grade 13 (Scale 7) of the N.J.B. Salary Scale.

The successful candidates for these posts shall be required to reside within reasonable travelling distance of Area Headquarters.

Applications, quoting appropriate reference number, should be submitted on the standard application form, which is obtained from the Area Secretary, P.O. Box 6, 75, Waterloo Street, Glasgow, C.2, and should be returned not later than Friday, 17th November, 1961.

2821

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

STATION SHIFT CONTROL ENGINEER is required at Walsall Power Station, Staffs. N.J.B. service conditions, superannuable appointment, salary within Schedule A of the Agreement, Grade J.10, £1,040-£1,165 per annum, plus 10% shift allowance.

A sound technical training and practical experience in the control of steam generating plant and main switchgear are required. Appropriate technical qualifications an advantage.

Apply, quoting Vacancy No. 244/61 MR, on form AE6, available from the Station Superintendent, Walsall Power Station, Reedswood Lane, Walsall, Staffs., to be returned by the 13th November, 1961.

2842

You'll find room to expand with 'ENGLISH ELECTRIC'

FRACTIONAL HORSE-POWER MOTOR DIVISION

SENIOR DESIGN AND DEVELOPMENT ENGINEERS

As a result of the expanding field of application of F.H.P. motors, The English Electric Company are about to make senior appointments to their Design and Development Department.

Qualified engineers experienced in this field, who are interested in developing and applying modern design methods possibly including the use of a digital computer are invited to submit details of their technical education, training and experience, quoting reference number ER0097B.

These appointments will be of particular interest to men seeking opportunities for greater responsibility.

Please reply to Tech. Staff Officer, Dept G.P.S., English Electric House, Strand, London, W.C.2.

'ENGLISH ELECTRIC'

2706

BRADFORD INSTITUTE OF TECHNOLOGY

Department of Electrical Engineering

APPLICATIONS are invited for the posts of SENIOR LECTURER and LECTURERS IN ELECTRICAL ENGINEERING.

These vacancies are created by the rapid expansion of the department, which is mainly concerned with Diploma in Technology courses, and the posts offer exceptional opportunities for teaching, consulting and research work.

Candidates should be suitably qualified to teach to final Diploma in Technology standard in electrical power or machines or electronics or telecommunications. Industrial and research experience will be a recommendation.

The successful candidate will be encouraged to develop industrial contacts and undertake research for which adequate facilities are available.

Salary scales (which are subject to revision at an early date) are as follows:—

Senior Lecturer	£1,550 to £1,750 p.a.
Lecturer ...	£1,370 to £1,550 p.a.

Previous industrial and research experience at a suitable level will be taken into account in fixing the commencing salary.

Further particulars and forms of application may be obtained from the Registrar (Department N), Bradford Institute of Technology, Bradford, 7.

HENRY PATTEN,
Clerk to the Governors.

2774

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 1 Sub-Area

THIRD ASSISTANT ENGINEER (Protection) required at No. 1 Sub-Area Headquarters, Liverpool. Salary will be within the range of £1,275-£1,410 per annum (N.J.B. M/10).

Duties will include power system protection and the testing and commissioning of H.V. cables, switchgear, transformers and associated equipment up to 33 kV.

Applicants should have had a general experience in the electricity supply industry and be technically qualified.

Special application forms obtainable from the Manager, No. 1 Sub-Area, 24, Hatton Garden, Liverpool, 3, should be returned not later than 17th November, 1961.

2822

THE UNIVERSITY OF LEEDS

Department of Electrical Engineering

APPLICATIONS are invited for appointment as LECTURER in the Department of Electrical Engineering at a salary on the scale £1,050 × £50 to £1,400 × £75 to £1,850 (efficiency bar at £1,550 a year, according to age, qualifications and experience. Applicants should have an Honours Degree in Electrical or Electronic Engineering and experience in some branch of electronic engineering.

Applications (three copies), together with the names of three referees, should reach the Registrar, The University, Leeds, 2 (from whom further particulars may be obtained), not later than 14th December, 1961.

2807

The Electricity Council

DEPUTY CHIEF SAFETY OFFICER

Applications are invited for the superannuable post of DEPUTY CHIEF SAFETY OFFICER in the Industrial Relations Department at Winsley Street.

Candidates should have practical engineering experience, a knowledge of accident prevention methods and their application, preferably in the Supply Industry, and be familiar with the Factories Acts and Regulations and other legal requirements regarding safety in the Industry. They should have good engineering qualifications; corporate membership of one of the engineering institutions would be an advantage.

● ***Salary within the scale £2,655-£2,875 p.a., inclusive of London Allowance.***

Applications stating age, present appointment and salary, qualifications and experience to E. Landucci, Winsley Street, London, W.1 by 18th November, 1961. Quote Ref. ER/135.

2773

EAST MIDLANDS ELECTRICITY BOARD

Mansfield and North Nottinghamshire Sub-Area

APPLICATIONS are invited from suitably qualified and experienced persons for the following appointments. Applicants should state age, qualifications, experience, etc., and quote the appropriate vacancy number.

GENERAL ASSISTANT ENGINEER
(Planning and Development)
(Vacancy No. 121/61).

Salary N.J.B. Class L, Grade 16, £765 to £870 per annum.

The duties include assisting in the planning and preparation of schemes and specifications for the extension and reinforcement of overhead and underground distribution systems up to and including 11 kV, and the design and layout of substations.

GENERAL ASSISTANT DISTRICT ENGINEER, Mansfield District (Newark)
(Vacancy No. 122/61).

Salary N.J.B. Class K, Grade 15, £765 to £870 per annum.

The duties include assisting in the operation, maintenance, planning and construction of rural and urban networks up to and including 11 kV.

Ability to drive a motor vehicle is essential, and the person appointed will be required to live in or near Newark.

Applications for the above vacancies should be forwarded to the Manager, Mansfield and North Nottinghamshire Sub-Area, Lime Tree Place, Mansfield, Notts., by the 17th November, 1961.

2825

CITY OF OXFORD EDUCATION COMMITTEE

College of Technology

School of Electrical Engineering

APPLICATIONS are invited for the post of LECTURER in Electrical Engineering, to commence duties in January, 1962.

Candidates should possess a good degree in electrical engineering or physics and/or be Corporate Members of the Institution of Electrical Engineers. An interest in measurements, coupled with teaching experience and recent industrial experience, are additional recommendations.

Salary at present £1,370 × £35 (4) × £40 to £1,550.

Further particulars and a form of application (stamped addressed envelope) may be obtained from the Principal, College of Technology, Headington Road, Oxford, to whom completed forms should be returned as soon as possible.

2858

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

APPLICATIONS are invited for the position of ASSISTANT ENGINEER (Planning) at the Hams Hall "A," "B" and "C" Power Stations. Salary will be in accordance with N.J.B. service conditions, Grade N.8 (£1,535-£1,720 per annum).

The successful applicant will be responsible for the detailed planning and progressing of plant overhauls and other work carried out on the Hams Hall site. Candidates should preferably possess H.N.C. or equivalent. Practical experience in the operation and maintenance of a modern power station and an understanding of the economic consideration underlying planning are required.

Apply, quoting Vacancy No. 242/61 MR, on form AE6, available from the Station Superintendent, Hams Hall Power Station, Lea Marston, Sutton Coldfield, Warks., to be returned by 13th November, 1961.

2841

Situations Vacant (continued)

Due to expansion the
CONTROL GEAR DIVISION
of
G.W.B. FURNACES LIMITED
require a

TECHNICAL SALES ENGINEER FOR SCOTLAND

THE company's products are particularly suited to heavy duty applications where reliability is of paramount importance, and the post offers wide opportunities to a man with good engineering contacts.

Applicants should reside in the Glasgow area, but be prepared to travel. Previous sales experience and ability to discuss technical problems on automatic control gear essential. No electronics involved. Qualifications to H.N.C. preferred, age 25 to 40.

A car will be provided, together with a generous salary and incentive bonus.

Detailed applications, in confidence, which will be acknowledged, to :—

Sales Manager, Control Gear Division
G.W.B. FURNACES LTD.
P.O. Box No. 4
Dibdale Works, Dudley, Worcs.

2787

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER,
Sutton District.

Salary £1,115-£1,245 per annum plus London allowance under N.J.B. Class G, Grade 7. This District (77,000 consumers) covers a dense urban area on the outskirts of London. Applicants, of good general education, should have had technical training to Higher National Certificate standard with practical experience of general distribution work, and be capable of carrying out planning, construction and maintenance work. Consideration will be given to a private car allowance and, in appropriate circumstances, to assistance with housing.

Applications, quoting ER, on forms from District Manager, SEEBOARD, 52, High Street, Sutton, by 15th November, 1961.

LINESMAN (over 30 kV),
East Sussex and South West Kent.

Wages 5s. 6¾d. per hour for 42-hour 5-day week under N.J.I.C. Agreement. Duties involve erection and maintenance of overhead lines up to 33 kV in all parts of the Sub-Area, operating from the Eastbourne depot. Superannuation optional after two years' service.

Applications, quoting ER and naming two referees, to East Sussex and South West Kent Manager, SEEBOARD, Westlords, Willingdon Road, Eastbourne, by 13th November, 1961.

GEORGE WRAY,
Secretary.

2814

WORKS MANAGER THERMO PLASTIC CABLES

APPLICATIONS are invited for the above vacancy. Applicants should possess an up-to-date knowledge of plant and production methods, with previous experience of thermo plastic resins, works organisation and staff control.

This is a senior appointment of interest only to men of outstanding ability.

Write personally to the Chairman, Permanoid Limited, Manchester, 4.

2775

YORKSHIRE ELECTRICITY BOARD

No. 4 (Leeds) Sub-Area
WETHERBY DISTRICT

DISTRICT COMMERCIAL
ENGINEER.

Applicants should be conversant with all matters connected with a District commercial organisation in a mixed rural and urban district and have had experience in negotiating with agricultural and industrial consumers, installation and contracting, public lighting, service centre organisation and load development, and the preparation of statistics and reports.

Salary N.J.B. Class F, Grade 3 (Scale 12), £1,350/£30/£1,500 per annum.

SUB-AREA HEADQUARTERS

FOURTH ASSISTANT ENGINEER
(Draughtsman).

Applicants should have had a good general and technical education and be experienced in the layout of plant in substations and in the preparation of electrical diagrams.

Salary N.J.B. Class L, Grade 12 (Scale 8), £1,040/£1,165 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, Leeds, not later than 17th November, 1961.

No. 2 (Huddersfield) Sub-Area
HALIFAX DISTRICT

INSTALLATION ENGINEER.

Applicants should have served a recognised apprenticeship and have had considerable experience in estimating and control of labour engaged on domestic, commercial and industrial installations and maintenance.

Salary N.J.B. Class J, Grade 8 (Scale 10), £1,190/£1,325 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market Street, Huddersfield, not later than 17th November, 1961.

No. 3 (Sheffield) Sub-Area
ECCLESFIELD DISTRICT

THIRD ASSISTANT DISTRICT
ENGINEER.

Applicants should have had experience in the work of a District engineering department.

Salary N.J.B. Class G, Grade 9 (Scale 7), £965/£1,090 per annum.

ROTHERHAM AND MEXBOROUGH
DISTRICT

DEMONSTRATOR.

Applicants should have successfully undertaken a recognised course in domestic subjects and preferably possess the Certificate of the Electrical Association for Women.

They must have experience in cooking practice, demonstration of electrical appliances, and be capable of advising consumers on the use of electricity in the home. The successful candidate will have to give public demonstrations.

Salary N.J.C. Grade 1, £600/£25/£700 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Change Alley, Sheffield, not later than 17th November, 1961.

2812

ELECTRICAL ENGINEER

CONSULTING ENGINEERS require an Electrical Engineer for progress and inspection duties in connection with heavy plant installation in the Midlands. Minimum qualifications H.N.C. (Elec.). Must be accustomed to dealing with manufacturers.

Please send full particulars to—Box 2830.

United Kingdom Atomic Energy Authority

THE CULHAM LABORATORY

for fusion and plasma physics research now being built at Culham, Abingdon, Berkshire, has vacancies for SHIFT TECHNICIANS for the Site Services Division. Shift Technicians will be responsible for the operation of all civil, mechanical and electrical site services and for liaison with the maintenance sections. There will be a fair degree of automation and hence some bias towards electrical engineering, but the successful candidates must be capable of operating all services.

Applicants should have served a recognised engineering apprenticeship or have similar qualifications. They should have had experience of site operation or maintenance and be prepared to work without supervision to maintain the continuity of the services. Some experience of control circuitry would be an advantage, whilst the possession of a Higher National Certificate is desirable.

Salary £1,060-£1,210 per annum.

Housing and contributory superannuation scheme.

Send a postcard for application form and further details to :—

The Senior Personnel Officer
(CAP/40/38/48)
CULHAM LABORATORY
Culham, Abingdon, Berks

2835

COUNTY COUNCIL OF THE WEST RIDING OF YORKSHIRE

Office of the County Architect

APPLICATIONS are invited for the appointment of ASSISTANT ELECTRICAL ENGINEER, A.P.T. III, salary range £960-£1,140 per annum.

Applicants should be Graduate Members of the Institution of Electrical Engineers and be capable draughtsmen with good experience in the design of schemes and the preparation of specifications and estimates for all classes of electrical work.

Applications to be submitted by the first post on Tuesday, 14th November, 1961, on forms to be obtained from and returned to the undersigned.

A. W. GLOVER, F.R.I.B.A.,
County Architect.

Bishopgarth,
Westfield Road, Wakefield.

2809

ELECTRICAL DESIGNER

AN intelligent, capable Senior Electrical Designer is required, preferably with experience of petro-chemical or heavy industrial installations, by a London engineering company.

Applicants must be able to accept responsibility as this is an expanding department and a policy of "promotion from within" operates. Salary expectation can be as high as £1,500 for the right man. Our present staff are aware of the vacancy.

Please send brief details of your experience, etc., to—Box 2777.

CONTROL ENGINEERING finds application in nearly every up-to-date Industry—Power Generation, Mining, Steel, Chemical, Oil, Machine Tools, Rubber and Plastics, Material Handling, Paper, Textiles, etc.

READ ALL ABOUT IT We are sure that there are many Electrical Engineers in these and other fields who would find an interesting and rewarding career in Control Engineering and for them brochures have been prepared describing not only the growth and activity of 'English Electric' at Kidsgrove, but also some interesting examples of Control Engineering. These we shall be happy to send you on request.

SEE ALL ABOUT IT There is a mobile display of some of the most up-to-date Control equipment which will be touring the country towards the end of November. If you happen to live or work in the vicinity of one of its stopping places, we shall be only too pleased to see you during the evening by appointment, and not only show you something of the up-to-date techniques being exploited in Control Engineering, but also discuss informally, and without obligation on either side, career opportunities in the Division.

CURRENT VACANCIES are for Control Engineers and Technical Sales Representatives. They need to be filled by men of about H.N.C. standard, or by those without formal qualifications who have extensive knowledge of and experience in conventional Control Gear.

WRITE NOW For the brochures mentioned above apply to: Director, Group Personnel Services, English Electric House, Strand, London, W.C.2. Please quote reference ER316E. If you would like to see the mobile display or wish to make formal application for one of the above vacancies, please give also details of qualifications and experience to date.

'ENGLISH ELECTRIC'

CONTROL ENGINEERING

2800

WESTERN REGIONAL HOSPITAL BOARD, SCOTLAND

Electrical Engineers (Main Grade)

Salary Scale £910 × £35 (1) × £40 (2) × £45 (5) × £50 (7) to £1,600 p.a.

APPLICANTS should be Corporate or Graduate Members of the Institution of Electrical Engineers, and have a wide experience in design, estimating and preparation of specifications and schedules to cover all types of electrical installation work, including power, lighting, heating, lifts, call systems, telephones, etc.

Graduate I.E.E.s enter at bottom of salary scale and their maximum salary is £1,205 until Corporate Membership is attained. Corporate Members can be considered for a starting salary between £1,160 and £1,300, depending on experience and number of years as a Corporate Member.

Applications, stating age, qualifications, experience, present and previous appointments, and the names of three referees, should be forwarded to the Secretary, Western Regional Hospital Board, 351, Sauchiehall Street, Glasgow, C.2.

2808

DESIGNER-DRAUGHTSMAN

required for interesting work on lighting fittings, mainly fluorescent. Must have sound knowledge of engineering principles and be capable of original thought. The work requires a knowledge of modern manufacturing methods, including pressure die casting, injection and compression moulding and extrusion of plastics, sheet metal fabrication and electrostatic painting.

Superannuation, canteen facilities, excellent working conditions.

Apply to Personnel Officer, Crompton Parkinson (Doncaster) Ltd., Wheatley, Doncaster.

2786

CORPORATION OF LONDON

APPLICATIONS are invited from suitably experienced candidates for the permanent post of RESIDENT DEPOT SUPERINTENDENT (Mechanical and Electrical Equipment) at the Corporation's new Public Cleansing Depot, Upper Thames Street, London, E.C.4, salary scale £990–£1,310 p.a. Commencing salary according to qualifications and experience and with free flat accommodation at the depot, available twelve months after appointment.

Candidates should hold a National Certificate in Mechanical and/or Electrical Engineering. Preference will be given to those experienced in maintenance of industrial plant, including oil-fired steam boiler plant and various types of electrical switchgear and motors.

Applications stating age, appointments held and experience, together with names of two referees, to the City Engineer, Guildhall, London, E.C.2, by 14th November, 1961.

2788

YOUNG

ELECTRICAL ENGINEER

required to join a team responsible in preparing tenders for and executing nuclear projects. This engineer will be responsible for developing new construction procedures involving electrical techniques.

The position is one offering wide experience and is not not purely electrical in scope. Successful applicant would be required to reside in London for approximately six months prior to taking up residence in the Glasgow area.

Write, giving age, precise details of previous positions held, qualifications and required salary to—Box 2855.

SOUTH WALES ELECTRICITY BOARD

General Assistant Engineer (Surveyor/Draughtsman)

APPLICATIONS are invited for the position of GENERAL ASSISTANT ENGINEER (Surveyor/Draughtsman) in the Port Talbot District of the Swansea and West Central Area.

Salary N.J.B. Class H, Grade 13, Scale 4, £765–£870 per annum.

Applications stating age, present position, salary, qualifications and experience should be addressed to G. R. T. Edwards, B.Sc., M.I.E.E., M.Am.I.E.E., Manager, Swansea and West Central Area, 29, Ystrad Road, Swansea, to arrive not later than 18th November, 1961.

Please quote reference 134/61/ER, endorsing envelope "Surveyor/Draughtsman."

R. G. WILLIAMS,
Secretary.

2854

CENTRAL ELECTRICITY GENERATING BOARD

Western Division

ASSISTANT SHIFT CHARGE ENGINEER (W/AV/107/61) required at Newton Abbot Power Station, Devon.

Superannuation scheme. Salary N.J.B. Class F, Grade 9, Scale 6, £890–£1,015 plus 10% shift allowance (minimum £90).

Applicants should possess good technical qualifications and have had training and experience in the control and operation of modern steam generating plant and main switchgear.

Applications on form A.E.6/ACT, obtainable from the Personnel Dept., 26, Oakfield Road, Bristol, 8, should be completed and returned by 13th November, 1961.

2815

***Situations Vacant** (continued)*

SOUTHERN ELECTRICITY BOARD

First Assistant District Engineer (Maintenance and Operation)

Basingstoke District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class F, Grade 5 (£1,275-£1,410 per annum). N.J.B. conditions of service.

Applicants, who must possess suitable technical qualifications, should have had extensive experience of system operation, and of the maintenance of switchgear, transformers and mains up to and including 33 kV, including minor construction work, and the commissioning of new mains and plant. The duties of the successful applicant include the supervision of technical staff engaged in this work.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, quoting Z.1430, not later than 13th November, 1961.

Planning Engineer

Basingstoke District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class F, Grade 7 (£1,040-£1,165 per annum). N.J.B. conditions of service.

The duties will include the preparation of schemes and estimates for extensions and/or reinforcement to overhead and underground networks up to and including 33 kV. The appointment will involve standby duties.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, quoting Z.1429, not later than 13th November, 1961.

Senior Assistant (Personnel)

No. 3 (Portsmouth) Sub-Area Office. Salary N.J.C. Grade 6 (£1,150 - £1,240 per annum. N.J.C. conditions of service.

The duties of the post will be to assist in all work affecting personnel, establishments, education and training, and kindred matters in the Sub-Area.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, quoting Z.1409, not later than 13th November, 1961.

Senior Assistant (Administration)

No. 2 (Newbury) Sub-Area Office. Salary N.J.C. Grade 6 (£1,150-£1,240 per annum). N.J.C. conditions of service.

The duties of the post will be to assist in all matters of general administration outside the personnel field, including all duties in connection with the acquisition and sale of property, in the Sub-Area Secretary's Department.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks., and returned to him, quoting Z.1410, not later than 13th November, 1961.

Service Representative

Aldershot District of No. 3 (Portsmouth) Sub-Area, located at the Petworth Branch. Salary N.J.C. Grade 2 (£700 × £25 to £775 per annum). N.J.C. conditions of service.

The duties of the post will be to advise on supply matters, tariffs, apparatus and sales to consumers with domestic or small commercial or industrial installations.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, quoting Z.1427, not later than 13th November, 1961.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

2828

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Region

East Midlands Division

ASSISTANT ENGINEER (Control Room), LEICESTER POWER STATION (Vacancy No. 235/61).

Applications are invited for the position of Assistant Engineer (Control Room) at Leicester Power Station, Rawdykes Road, Leicester.

Candidates for this post should be suitably qualified and have had experience in the control room.

Salary will be in accordance with Class G, Grade 13 (£715 - £805 per annum) of the National Joint Board Agreement, plus £90 per annum allowance whilst engaged on shift duties.

Closing date for receipt of applications, 17th November, 1961.

This appointment is pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent and should be returned to him by the date stated.

O. S. WOODS,
Assistant Regional Director.

2817

SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following positions :—

SECOND ASSISTANT DISTRICT ENGINEER, WEST CORNWALL.

Salary within Class G, Grade 7, Salary Scale 9 (£1,115 to £1,245 per annum) of Schedule A of the N.J.B. Agreement.

The successful candidate will be required primarily to assist in the construction work on the distribution system up to and including 33 kV; his duties may also include giving assistance on operation and maintenance as and when required.

The person appointed will be required to take part in a rota of standby duty for the whole District to deal with faults and interruptions to supply.

Previous all-round experience on both H.V. and L.V. overhead and underground networks and substations in rural and urban areas, and appropriate technical qualifications at least equivalent to the Higher National Certificate are necessary. Possession of a current driving licence is desirable.

Applications for this post to be made on standard form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, 13, Basset Road, Camborne. Closing date for receipt of completed applications is 18th November, 1961.

THIRD ASSISTANT DISTRICT ENGINEER, BATH.

Salary within Class G, Grade 9, Salary Scale 7 (£965 to £1,090 per annum) of Schedule A of the N.J.B. Agreement.

The duties of the successful candidate will be to assist generally in the planning, construction, operation and maintenance of overhead and underground lines and substations for voltages up to and including 33 kV. The person appointed will be required to undertake standby duty.

Candidates should hold the Higher National Certificate in Electrical Engineering or qualifications leading to it. Possession of a current driving licence is desirable.

Applications for this post to be made on standard form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, The Old Bridge, Bath. Closing date for receipt of completed applications is 18th November, 1961.

2839

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the superannuable position of OPERATION SUPERINTENDENT at KINCARDINE GENERATING STATION.

The station consists at present of 3 120-MW units, with 2 200-MW units in course of construction. The units are coal fired with re-heat, having steam conditions of 1,500 p.s.i., 1,000° F. for the 120-MW units and 2,350 p.s.i., 1,050° F. for the 200-MW units.

Candidates should possess technical qualifications of not less than Higher National Certificate standard and, preferably, be Members of the Institution of Electrical or the Institution of Mechanical Engineers. They should have had considerable operation experience in modern generating stations. The successful applicant will be responsible to the Deputy Superintendent for the efficient operation of all station plant and for the control of the operation staff.

Salary N.J.B. Class K, Grade 4, £1,650/£1,830, rising ultimately to Class M, Grade 4, £1,920/£2,085.

Applications, quoting reference G.33/61, should be submitted on the standard form to the Secretary, South of Scotland Electricity Board, Inverlair Avenue, Glasgow, S.4, not later than 17th November, 1961.

2799

LIAISON ENGINEER

Responsible for Technical Supplies

The rapidly expanding business of specialised electronic tube and valve manufacture calls for a large variety of special components and materials, often in uneconomical production quantities. A leading manufacturer is posed with the problem of obtaining these supplies against short term delivery at the same time to tight specification.

We are seeking a man, probably aged 30-40, with a dynamic personality to take up a new post to liaise between outside suppliers and production development departments. He would ideally have a good background in light engineering industry, but should also have some knowledge of purchasing problems and sources of supply in the electronic industry.

The position will involve the selected candidate in travel at home and abroad for short periods.

We are prepared to pay a man with the right background and personality £1,400–£1,600 per annum.

Please reply, in confidence, to Box No. 2802

Assistant Electrical Engineer

British Nylon Spinners Ltd. requires an Assistant Electrical Engineer in the Head Office of the Chief Engineer's Department.

Candidates should be in the age range 25—30 and must be graduates of the Institution of Electrical Engineers. Additionally, candidates must have a University degree or D.F.H. Experience in some of the following fields would be an advantage:

(a) Modern techniques of electrical installation work in large factories, including sub-stations and cable work.
(b) Electricity Supply.
(c) Rotating plant and variable speed drives.

The Company is situated in a most attractive countryside, within easy reach of towns. Rented houses are available at comparatively short notice; whilst assistance is given with removal and other expenses. Profit sharing and contributory pension schemes operate.

Please write, quoting reference E.186 to the Personnel Officer,

British Nylon Spinners Limited
PONTYPOOL MONMOUTHSHIRE

2785

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Region

Electrical Engineer's Department

A THIRD ASSISTANT ENGINEER is required in the Plant Design and Investigations Section of the Technical Branch based on Leeds.

The section is concerned with design problems relating to the major electrical plant items in power stations and on the transmission system and the investigation of faults and breakdowns, including the preparation of reports.

Candidates should have had manufacturing, operating or design experience in the generation or transmission field and technical qualifications leading to Corporate Membership of the I.E.E.

The salary for this appointment will be in accordance with the National Joint Board Agreement, Grade 8, Class K (£1,145-£1,410 per annum).

Forms of application may be obtained from the Regional Personnel Officer, Central Electricity Generating Board, North Eastern Region, 1, Whitehall Road, Leeds, 1, to whom they should be returned to arrive not later than 10th November, 1961.

2769

ENGINEER OR QUANTITY SURVEYOR

required by Electrical Contractors for Accounts Department. Applicants must be experienced in site measurement, contract conditions and procedure, and able to negotiate tender and account prices.

Write stating age, experience very fully, previous employment and present salary to:—

Box 2820

UNIVERSITY OF BRISTOL

Electrical Engineering Department

APPLICATIONS are invited for a LECTURESHIP (Grade II) in ELECTRICAL ENGINEERING. Candidates must have good academic qualifications in electrical engineering, physics or mathematics; and some training and/or experience in the applications of electricity. An interest in electrical power and machinery, in which the facilities for research are exceptionally good, is desirable.

The post will be vacant on 1st April, 1962, but a later (or earlier) starting date might be arranged. Applicants should give full particulars of age and career to date, and the names of at least two persons to whom reference may be made. Salary according to age and experience, on the scale £1,050 to £1,850, with family allowance (where appropriate) and superannuation on F.S.S.U. terms.

Applications (or provisional enquiries from interested persons) should be submitted as soon as possible to the undersigned, from whom further particulars may be obtained.

H. C. BUTTERFIELD,
Registrar and Secretary.

2725

BIC (SUBMARINE CABLES) LTD.

require an ELECTRICAL ENGINEER to undertake development work, including testing, on submarine power cables and accessories.

The selected candidate will be required to organise and progress the development work up to and including production against customers' requirements.

Applicants should hold an engineering degree, H.N.C. or its equivalent, and preferably have the knowledge of power cable design and manufacture.

Good prospects and salary.

Apply to the Secretary, British Insulated Callender's (Submarine Cables) Ltd., Trafford Park, Manchester, 17.

2827

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Region

Regional Electrical Department

APPLICATIONS are invited for the positions of three FOURTH ASSISTANT ENGINEERS (Measurements) in the Technical Branch of the Regional Electrical Department as follows:—

(a) One Engineer to be based at Newcastle upon Tyne to assist in site maintenance and testing of electrical measuring apparatus.

The appointment will be made at National Joint Board, Grade 10 in the Regional Classification, Class K (£980-£1,245 per annum).

(b) Two Engineers to be based at Leeds to assist in maintenance and testing of electrical measuring apparatus in the Regional Testing Laboratory.

The appointments will be made at National Joint Board, Grade 11 in the Regional Classification, Class K (£900-£1,165 per annum).

Applicants should preferably have had experience in the testing and calibration of precision polyphase and summation metering equipments associated with H.V. bulk supplies, indicating instruments and laboratory standardisation, and possess a Higher National Certificate in Electrical Engineering or its equivalent.

Applications stating the post applied for should be made on form AE.6, obtainable from the Regional Personnel Officer, Central Electricity Generating Board, North Eastern Region, 1, Whitehall Road, Leeds, 1, to whom they should be returned to arrive not later than 8th November, 1961.

2717

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

North Caledonia Area

APPLICATIONS are invited for the following superannuated posts:—

FOURTH ASSISTANT ENGINEER
(Operation and Maintenance)
(Vacancy No. 61/21).

For duty with a maintenance squad at Elgin, Morayshire. Experience in the construction and maintenance of overhead lines and/or substations is desirable. Technical qualifications Ordinary National Certificate or equivalent. Salary Class H, Grade 13 (Scale 4), £765-£870.

GENERAL ASSISTANT DISTRICT ENGINEER (East District)
(Vacancy No. 61/22).

To assist the Section Engineer at Fraserburgh, Aberdeenshire. Practical experience required and some knowledge of the electricity supply industry would be an advantage. Technical qualifications Ordinary National Certificate or equivalent. Salary Class F, Grade 11 (Scale 4), £765-£870.

Salary and conditions in accordance with the N.J.B. Schedule.

Application forms, obtainable from the Area Manager, West Villa, South Street Elgin, should be returned by 20th November, 1961, quoting the appropriate vacancy number.

2823

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE CO. LTD.

Longridge House, Manchester, 4

ELECTRICAL SURVEYORS required in England and Scotland. Permanent positions carrying progressive salary scale £825 to £1,225 with non-contributory pension. Candidates, aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E., and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience.

2805

***Situations Vacant** (continued)*

THE DISTILLERS COMPANY LIMITED

ASSISTANT ELECTRICAL ENGINEER

The company invites applications for appointment as Assistant Electrical Engineer at the Research and Development Establishment at Great Burgh, near Epsom, Surrey.

Candidates, in the age range 30-40, should hold the Higher National Certificate in Electrical Engineering or an equivalent qualification, and have completed a recognised apprenticeship in Electrical Engineering. They should have had experience in the design, installation and maintenance of electrical installations in workshops, etc., including the preparation of lighting and power wiring diagrams, and contract schedules of work.

Write :—

STAFF MANAGER
THE DISTILLERS COMPANY LIMITED
21/22, BOLTON STREET
LONDON, W.1

Quote Reference 75/61 E.R.

2793

LONDON ELECTRICITY BOARD

Vacancies: Engineering Draughtsmen

APPLICATIONS are invited for vacancies in the Chief Engineer's Design and Planning Branch Drawing Office at Lesco House, Stamford Street, London, S.E.1.

Duties will include the design and layout of main substations, alternatively surveying on site and constructional details in connection with the laying of E.H.V. transmission cables.

Candidates should have received a good general and technical education and possess the O.N.C. in Electrical Engineering. They should preferably be not less than 22 years of age.

The posts are graded under Schedule A of the National Joint Board Agreement, Class BX (Area), as Grade 12, salary range £875 to £1,140 per annum inclusive of London allowance, alternatively as Grade 13, salary range £820 to £1,065 per annum inclusive, respectively.

Application form obtainable from the Personnel Officer at 46, New Broad Street, London, E.C.2, to be returned completed within 14 days of the publication date of this notice. Please quote ref. PER/V/3448/R.

2801

SENIOR ELECTRICAL ESTIMATOR

responsible for preparing estimates for complete projects and obtaining specialists' advice and assistance on other sections where necessary. Applicants should have served an electrical apprenticeship and had several years' experience of electrical engineering. A technical qualification would be an advantage, but is not essential.

The salary range is £18 7s. 6d. to £21 10s. The company offers excellent employee benefits, including an annual bonus, a pension scheme and a voluntary part-contributory life insurance plant.

Please apply, quoting JAW/23, to :—

Men's Personnel Department
KODAK LIMITED (Factories)
Harrow
Wealdstone, Middlesex

2851

MONMOUTHSHIRE COUNTY COUNCIL

County Architect's Department

Appointment of Electrical Engineer

APPLICATIONS are invited for the appointment of ELECTRICAL ENGINEER at a salary in accordance with Grade A.P.T. III, viz., £960 rising by annual increments to £1,140 per annum.

Applicants should possess the Higher National Certificate in Electrical Engineering and should have had a sound technical training with some knowledge of installation practice in large buildings. They should be good draughtsmen and capable of preparing drawings and specifications under limited supervision.

Commencing salary within the above grade commensurate with the successful applicant's qualifications and experience.

The post will be subject to the provisions of the Local Government Superannuation Act.

Forms of application and particulars of the post and conditions of service may be obtained from S. Leyshon, A.R.I.B.A., County Architect, Queen's Hill, Newport, Mon., to whom the application, together with the names of at least two referees, must be returned not later than Monday, 20th November, 1961.

VERNON LAWRENCE,
Clerk of the Council.

County Hall,
Newport, Mon.

2816

MORRISON OF SOUTHAMPTON

wish to appoint

HOME SALES MANAGER
EXPORT SALES MANAGER

THE company's manufactures are primarily engine-driven generating sets of all types from 500 w. up to 200 kVA, the majority being built to customers' special requirements. The successful applicants, who will be responsible to the Sales Director, should be electrical engineers with a knowledge of generating sets and their applications, and have substantial appropriate sales and commercial experience.

The appointments will carry a good commencing salary and other benefits in a progressive and expanding organisation.

Applications, with full details of career, salaries at present and expected, should be addressed in the first instance to the Secretary, A. C. Morrison (Engineers) Ltd., Town Quay, Southampton.

2795

BRIGHTON EDUCATION COMMITTEE

Brighton Technical College

Principal: G. E. Watts, C.B.E., M.A., Ph.D.(Cantab), B.Sc.(London), F.R.I.C.

REQUIRED for 1st January, 1962 :—LECTURER IN ELECTRICAL ENGINEERING to teach to final degree and diploma standards. Ability to offer a specialist subject an advantage. Degree, or corporate membership of professional institution, plus teaching experience required.

Salary £1,370 by £35 (4) plus £40 to £1,550 (under review). Increments may be allowed in this scale for approved experience.

Further particulars and forms of application from the undersigned, to be returned to the Principal, Brighton Technical College, Richmond Terrace, Brighton, 7, not later than 21st November, 1961.

W. G. STONE,
Director of Education.

54, Old Steine,
Brighton.

2837

ELECTRICAL SERVICE MECHANIC

EXPERIENCED ENGINEER, preferably to O.N.C. (Elect.) standard, required for compact service department at Cricklewood, to be responsible for test and repair of domestic electrical appliances and similar products. Should have workshop practice and knowledge of stores control with ability to work on own initiative and deal with customers' enquiries by correspondence and telephone.

Progressive pensionable post with commencing salary between £15/£16 p.w. according to experience.

Applications giving age, previous work history and qualifications to Appointments Officer (P.A.53), Remploy Limited, 415, Edgware Road, London, N.W.2.

2829

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Northern Area

General Assistant Engineer: Wick

APPLICATIONS are invited for the above post. Minimum technical qualifications: Ordinary National Certificate in Electrical Engineering. Experience on H.V. and L.V. underground and overhead distribution systems will be an advantage.

Salary (Wick) £715 - £805, N.J.B. D.10, Scale 3. Superannuation scheme.

Application forms obtainable from Area Manager, High Street, Dingwall, should be returned by 24th November, 1961.

2806

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT SECTION ENGINEER required in the Liverpool North District of the Board's No. 1 Sub-Area. Salary within range £1,115/£1,245 per annum (N.J.B. J/9).

Applicants should have had technical training and had operational experience of H.V. and L.V. networks including substations. Technical qualifications desirable.

Appointment subject to medical examination. Pension scheme.

Application forms may be obtained from the Manager, No. 1 Sub-Area, 24, Hatton Garden, Liverpool, 3, and should be returned not later than 17th November, 1961.

2796

WANTED

ELECTRICAL ENGINEER

(aged about 30-35)

for estimating and supervising electrical contracts. Good salary and bonus paid to keen, energetic man capable of accepting responsibility. Permanent position with pension.

Assistance with housing if necessary.

Applications in writing (stating age, experience, technical qualifications and salary required) will be treated with STRICTEST CONFIDENCE and should be made to :—

Messrs. A. ANDERSON & SON
(ELECTRICAL ENGINEERS) LTD.
100, Grange Road, Middlesbrough

2826

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 2 Sub-Area

THIRD ASSISTANT ENGINEER (Planning) required at the Board's No. 2 Sub-Area Headquarters, Sandiway House, Northwich, Cheshire. Salary within range £1,190/£1,325 per annum (N.J.B. L/10, Scale 10).

Applicants should have received a sound training in overhead and underground distribution work and have a good knowledge of the technical and economic principles underlying the design of distribution systems. Possession of an appropriate technical qualification is desirable.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager at the above address. Closing date 17th November, 1961.

2813

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Aberdeen Area

APPLICATIONS are invited for the post of GENERAL ASSISTANT ENGINEER (Technical). Duties will include assisting with radio and line telephony, supervisory control and other communication systems.

Ordinary National Certificate or equivalent qualification and some experience of maintenance of light-current equipment required.

Salary commencing within range £715-£940 per annum. N.J.B. Class H.14/12. Superannuation scheme available.

Application forms should be returned not later than 16th November, 1961, to the Area Manager, North of Scotland Hydro-Electric Board, Millburn Street, Aberdeen.

2824

Eastern Electricity

Essex Sub-Area

THIRD ASSISTANT ENGINEER, Control (Shift Duties), Sub-Area Headquarters (222/61.R). Candidates should be experienced in the operation of a large high-voltage distribution system; be fully conversant with the Central Electricity safety rules (distribution), and be capable of taking charge of all system operation during their shift.

Salary N.J.B. Class M, Grade 10 (£1,325-£1,460) inclusive of London allowance plus 10% shift allowance.

Apply by letter to C. C. Brazier, A.M.I.E.E., Engineer, Essex Sub-Area, Eastern Electricity Board, Millfield, Bentley, Nr. Brentwood, Essex, by 17th November, 1961.

2852

CITY OF LEICESTER

City Surveyor's Department

APPLICATIONS are invited from suitably experienced persons for the appointment of FOREMAN in the Street Lighting Section of my Department on Salary Grade Misc. IV (£625-£685 p.a.). The successful applicant will be required to drive a motor cycle and must hold a current driving licence.

The Local Government Superannuation Acts apply.

Applications, stating age, qualifications and experience, should be forwarded to me by 15th November, 1961.

JOHN L. BECKETT, M.I.C.E.,
City Surveyor.
Town Hall, Leicester.

2818

MIDLAND SILICONES LIMITED

a member of the Albright & Wilson Group of Companies, have a vacancy for a

SENIOR ELECTRICAL DRAUGHTSMAN

to be engaged on the design and layout of industrial installations.

The successful candidate will be over 25 years of age and will hold an H.N.C., A.1 or equivalent in I.E.E. The company is an expanding one and the prospects both in the Company and in the Group are good.

Conditions of service are excellent.

Apply in writing giving details of age and previous experience to Personnel Officer, Cardiff Road, Barry, Glamorgan.

2804

A REPRESENTATIVE is required by a company manufacturing small electro-mechanisms, to cover London and the South Eastern area. Applications are invited from experienced men, with an electrical engineering background, within the age group 25/35 years. Write—Box 9599, Frost-Smith Advg., 64, Finsbury Pavement, London, E.C.2. 2771

ADDITIONAL supervising engineer for London contractor. One able to run contracts from inception to final accounts and be responsible to manager for same. Only person who has had several years' experience in similar capacity would suit. Good salary and prospects. —Box 106.

AN experienced armature winder, also an electrical tester, is required by Max Arc Ltd., of Walton-on-Thames, Surrey. Congenial atmosphere. Good prospects for the right person. 176

ASSISTANT electrical engineer of O.N.C. standard to assist in preparation of electrical content of tenders for company's mechanical products, mainly pumping and hydraulic equipment, and dealing with electrical aspects of customers' orders. Experience in estimating for electrical installation work and selection of motors, control gear, etc., and knowledge of relay circuits an advantage. Will be required to undertake delegated duties in connection with works electrical and mechanical maintenance dept. involving knowledge of Factories Acts. Write stating age, experience, qualifications to Assistant Managing Director, Tangyes Limited, Cornwall Works, Smethwick. 2778

BOOK-keeper, male or female. This is a responsible position and a good salary will be paid. Please state present earnings and when available. References would be required. —Box 107.

CHIEF inspector, fully experienced, required by relay and electrical control gear manufacturers to take charge of test department. Boreham Wood, Herts. district. Telephone Elstree 2291 or write to—Box 2832.

CLERK of works for mechanical and electrical engineering services installations contracts at Seaton Barracks, Crownhill, Plymouth. The appointment will be for a period of approximately 20 months from April, 1962. Forms of application available from Hoare, Lea & Partners, Consulting Engineers, 5, Headland Park, Plymouth. 2763

COMMERCIAL sales engineer required by merchant company operating in the Far East, for service in the Federation of Malaya. Minimum qualification O.N.C. (either elec. or mech.); age about 25. Good salary, scale according to qualifications and experience; excellent prospects. Annual increments; provident fund; non-contributory pension scheme; free furnished accommodation; passage provided. Apply by letter—Box 2067, c/o Abbotts, Eastcheap, London, E.C.3. 2792

CONTRACTORS who specialise in overhead line and cable laying contracts require young engineers and young foremen with experience and initiative.—Box 2789.

ELECTRICAL draughtsman/engineer required by electrical consultants.—Brown & Hooker, 123 Warwick Rd., London, S.W.5. 2790

DESIGNER (H.N.C. Electrical), with experience in design of small mechanisms and low-voltage switchgear, required by a company expanding its range of switchgear products. Applicants will be responsible for the original design and further development. Applications in writing giving full details of qualifications and experience should be made in confidence to the General Manager, Austinlite Limited, Pickersleigh Road, Malvern. 2836

ELECTRICAL contractors require a deputy for the contracts manager. Should be capable of supervising medium-size contracts and have knowledge of estimating. Salary £950 per annum, free pension scheme. Apply in writing to—Box 8374.

ELECTRICAL engineer/draughtsman. Chance Brothers Limited, Glassworks, Smethwick, have a vacancy for an electrical engineer/draughtsman. The work is concerned with investigating technical problems, design of special equipment and layout of electrical services. Applications are invited from graduates and from men with Higher National Certificate qualifications, and should be addressed to the Personnel Manager, giving age, qualifications and experience. 2791

ELECTRICAL engineer required to assist director of well-established engineering business. Age preferably 30/50. Essential qualifications are drive, organising ability, tact and integrity, coupled with design and production experience. Modern works situated ten miles east Manchester with good working conditions. Post is covered by life assurance and good contrib. pension scheme. Salary envisaged around £1,500 depending upon experience. This can be an exceptional opportunity for a man with ability and capacity for work to make for himself a good position in one of the smaller but expanding firms manufacturing high-grade specialised products. Please give in confidence fullest details, education, training, experience and present position with salary (in date order), to—Box 2845.

ELECTRICAL engineers experienced in the design and manufacture of small electromechanical devices are required by an established manufacturer of electrical measuring instruments. The company operates a modern contributory pension scheme in addition to participation in the national graduated scheme. Canteen facilities and 38½-hour week. Apply to the Secretary, The Record Electrical Co. Ltd., Broadheath, Altrincham, Cheshire. 2779

ESTIMATING and supervising engineers required London contractors. Applicants must be capable of handling all types of industrial installations from enquiry to completion. Salary in accordance with qualifications and experience. Particulars in confidence to—Malcolm & Allan (London) Ltd., 229, High Street, Acton, London, W.3. 2819

LARGE electrical contractors (London) require chief estimator. Excellent prospects, superannuation scheme, etc. Write giving full details to—Box 2833.

REMUNERATIVE short-term engagement (12-18 months) on consulting engineer's staff on large industrial installation Liverpool area.—Box 2846.

SALES office. Intelligent, experienced man required for appointment in sales office of a company engaged in the manufacture of electrical switches in the specialised field. Must be able to conduct own correspondence and ability to type also essential. Knowledge of home and export invoicing required. Salary according to qualifications and experience. Please apply, giving full particulars, to—Castelco (Great Britain) Ltd., High Street, Old Woking. 2797

SALES representative required for electric cables in the London and Home Counties area. Previous experience necessary. Apply—Sales Manager, Hackbridge Cable Co. Ltd., Kelvin Works, Hackbridge, Surrey. 2831

TRANSFORMER design engineer required for automatic float battery chargers and associated equipment. Salary commensurate with experience. Pension scheme. Apply—Mr. W. E. Simmons, Harmer & Simmons Ltd., Roebuck Road, Hainault, Essex. 8367

WELL-educated young man, aged between 25-35, with sound electrical training, required as technical representative for the sale of resistance alloys in the Midlands and South. Excellent prospects for the right man. Apply by letter to—General Sales Director, Hall & Pickles Ltd., Port Street, Manchester, 1. 2734

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

A SENIOR project engineer, A.M.I.E.E. Development light and medium products. Instruments. Domestic. Testgear. New successful ideas and production improvements. Surrey approx. Now.—Box 8369.

ACTIVE electrical technician (C. & G.) (42), experienced estimating, contracting, plant maintenance, seeks change.—Box 8368.

CHIEF engineer, at present with British group in India, desires similar or electrical engineer's position in U.K. Returning Feb./Mar., 1962.—Box 8372.

EST.-sup.-engnr., elec. contracting, exp. enquiry to final acct., desires progressive post, Sussex/Surrey/London area.—Box 8373.

GRAD. I.E.E. (38), industrial and local government, seeks position with consulting engineers not in London.—Box 8359.

SALES BY AUCTION

Forty-sixth Sale

E R

By Order of the Secretary of State for Air

No. 25 MAINTENANCE UNIT,
ROYAL AIR FORCE,
HARTLEBURY, WORCESTERSHIRE
(4 miles from Kidderminster, 11 miles from Worcester).

NOCK & JOSELAND
are instructed to Sell by Auction at the above Unit on
THURSDAY, 9th NOVEMBER, 1961
at 11 a.m. prompt
a Large Quantity of
VALUABLE MISCELLANEOUS STORES

including Clothing and Equipment, Footwear, Dinghies, Parachutes, Cameras and Photographic Equipment, RADIO and ELECTRICAL EQUIPMENT, Furniture and General Stores, Gymnasium Equipment.

VIEWING: With the exception of the Furniture, the Lots are on View at Hartlebury on Tuesday and Wednesday, 7th and 8th November, 1961, between the hours of 9 a.m. and 4 p.m., and on the morning of the Sale Day between the hours of 8 a.m. and 11 a.m.

The Furniture is on View at the R.A.F. Stations at Cosford, Bridgnorth and Cranwell on Monday, Tuesday and Wednesday, 6th, 7th and 8th November, 1961, between the hours of 9 a.m. and 4 p.m.

Admission only on production of Catalogue, which admits two persons on the View Days and one person on the Sale Day. The Secretary of State for Air reserves the right to refuse admission. Catalogues, price ONE SHILLING EACH (Postal Orders, NOT Stamps) can be obtained from the Auctioneers:

NOCK & JOSELAND
Bank Buildings, Kidderminster
(Tel. 2053 & 4211)

2705

ARTICLES FOR SALE

HOUSE SERVICE METERS

200-240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr.

UNIVERSAL ELECTRICAL CO.
221, City Road, London, E.C.1 37

A. C. DIBLEY & CO. LTD.

CANTERBURY HOUSE
CANTERBURY RD.
LONDON, N.W.6
MAIda Vale 8012

HAVE AVAILABLE FOR IMMEDIATE SALE

VARIABLE SPEED
A.C. COMMUTATOR MOTORS
400/415 VOLTS 3 PHASE 50c/s

One 30 H.P. 1100/220 R.P.M.
One 40 H.P. 1080/360 R.P.M.

One 40 H.P. 1440/420 R.P.M.
Two 55 H.P. 870/200 R.P.M.
One 60 H.P. 1650/250 R.P.M.
Two 20/60 H.P. 885/295 R.P.M.
One 75 H.P. 1650/250 R.P.M.
One 75 H.P. 920/230 R.P.M. 500 v.
Three 80 H.P. 760/190 R.P.M.

One "REGREMO" DRIVE
75 H.P. 1500/30 R.P.M.

2811

A.A. ELECTRICAL Co. for A.C.-D.C. motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI. 5105. 67, Rothschild Rd. London W.4. 57

A.C. and D.C. slotmeters and quarterlies. Reconditioned, guaranteed 2 years. Repairs and recalibrations.—Victor Electric Co., South View, Sweet Hill, Patcham, Brighton, Sussex. 8336

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

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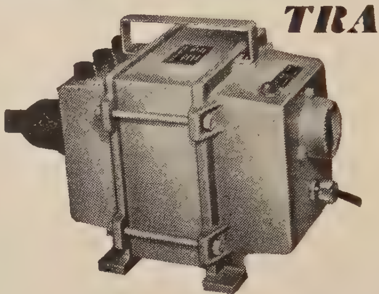

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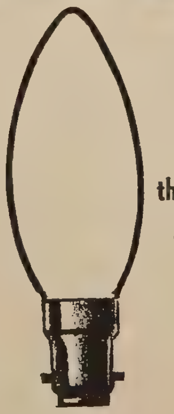

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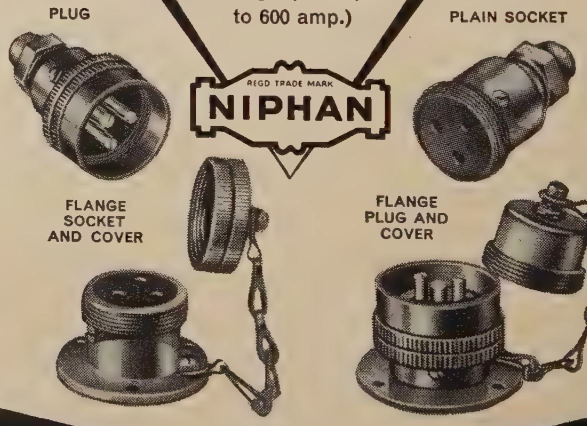

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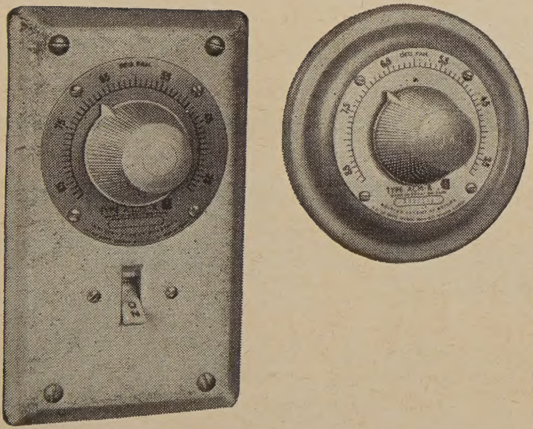

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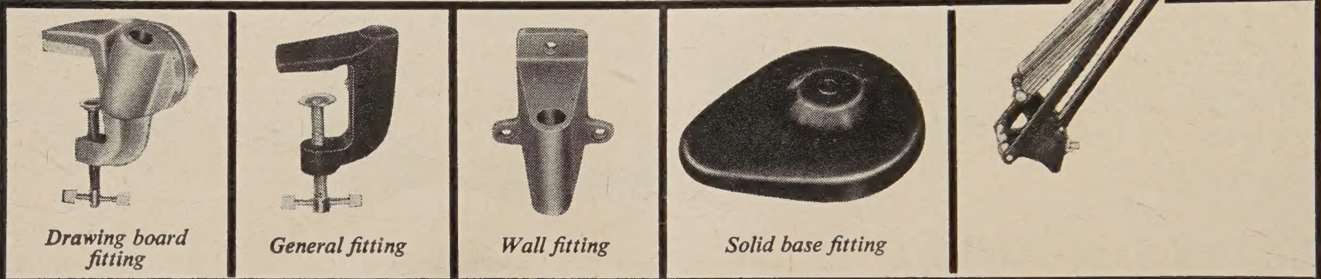

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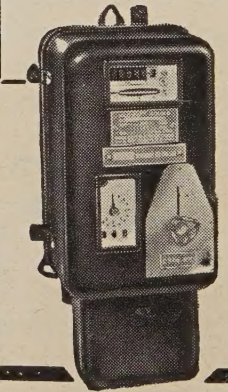

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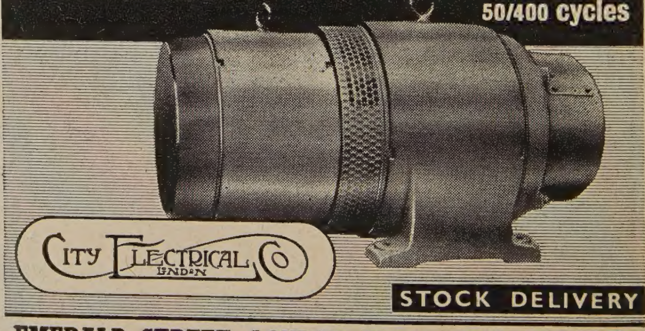

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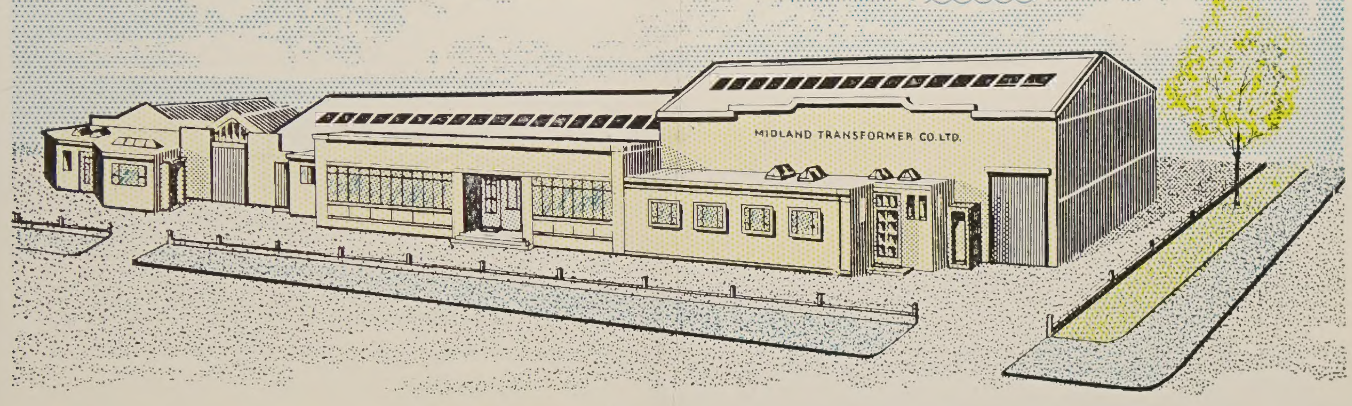
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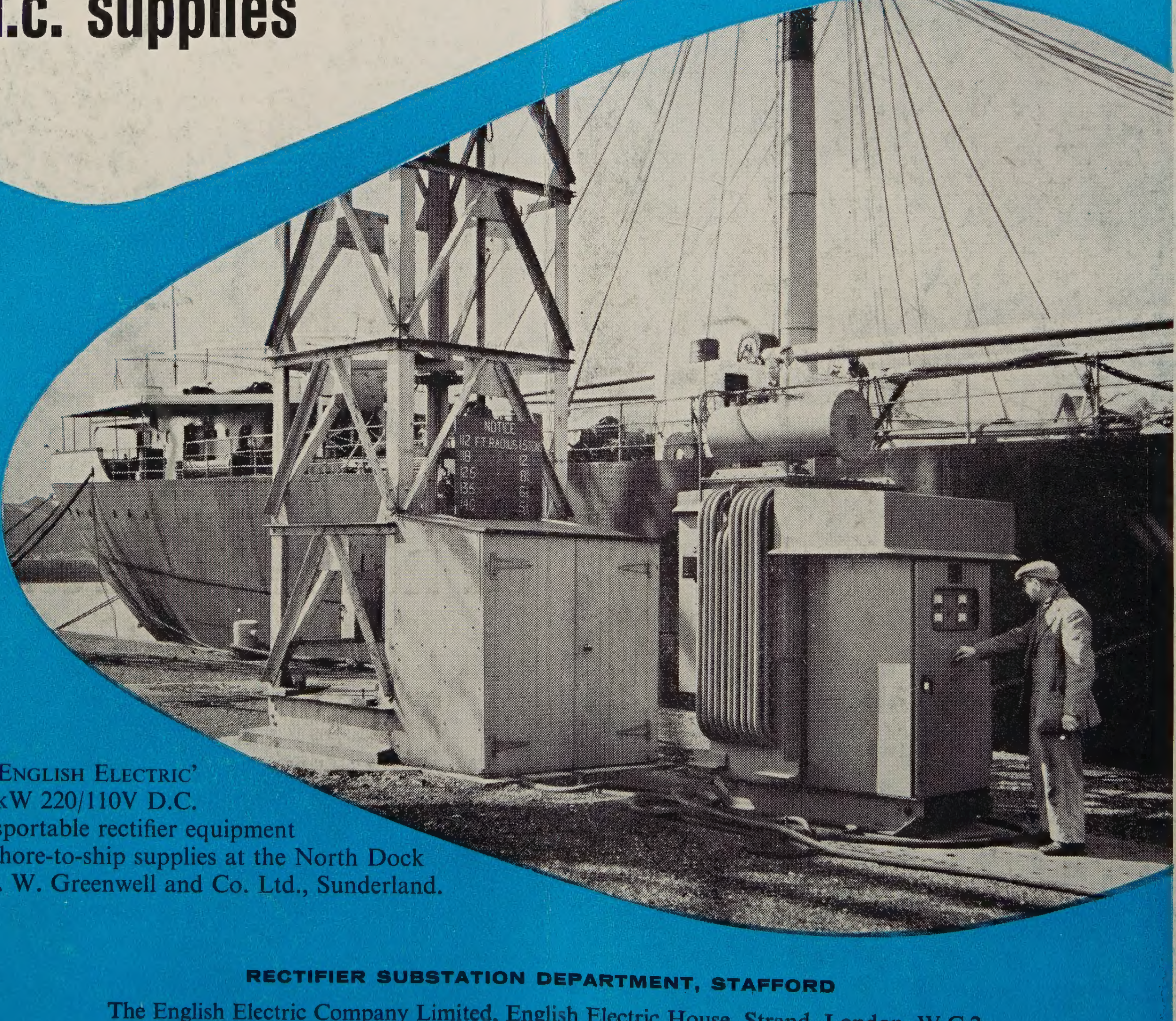

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